CAORF 27-9036-04

SHIPHANDLING SIMULATION BASED EVALUATION OF PROPOSED CHANNEL IMPROVEMENTS IN BOSTON HARBOR

DTMA 91-88-C-80024
Task Order 4

FINAL REPORT

APPENDICES

Prepared for:

Department of the Army
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254-9149

Prepared by:

Computer Aided Operations Research Facility
National Maritime Research Center
U.S. Merchant Marine Academy
Kings Point, New York 11024

MarineSafety
international

December 1992

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APPENDICES

APPENDIX A

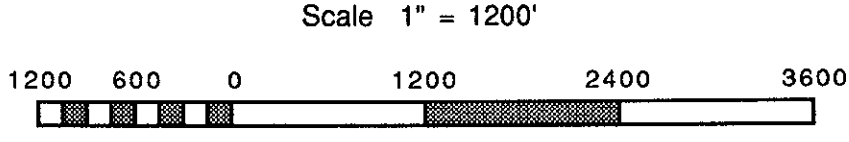
Individual and Composite Trackplots

EXPLANATION OF TRACKPLOTS

Track plots of all the individual runs and composite track plots showing the overlay of all five runs for a particular scenario are presented on the following pages. They are arranged in numerical order based on the scenario numbers shown in Figure 2 of the main report. The File ID number in the upper left corner of all the plots describe which run is represented. The following Table should be used to decode the File ID numbers. An * in the 5th digit indicates a composite plot, which shows all transits for that scenario. A repetition number of 1 indicates the pilot's second attempt at that particular scenario.

DIGIT	DESCRIPTION
1st	Boston Project Code = 5
2nd 3rd 4th	Three Digit Scenario Code
5th	Pilot Number (1 - 5)
6th	Repetition Number
7th	Not Used
8th	Not Used

All plots are provided at a scale of 1" = 1200' to allow the complete transits to be shown on one plot. A distance scale is provided below.



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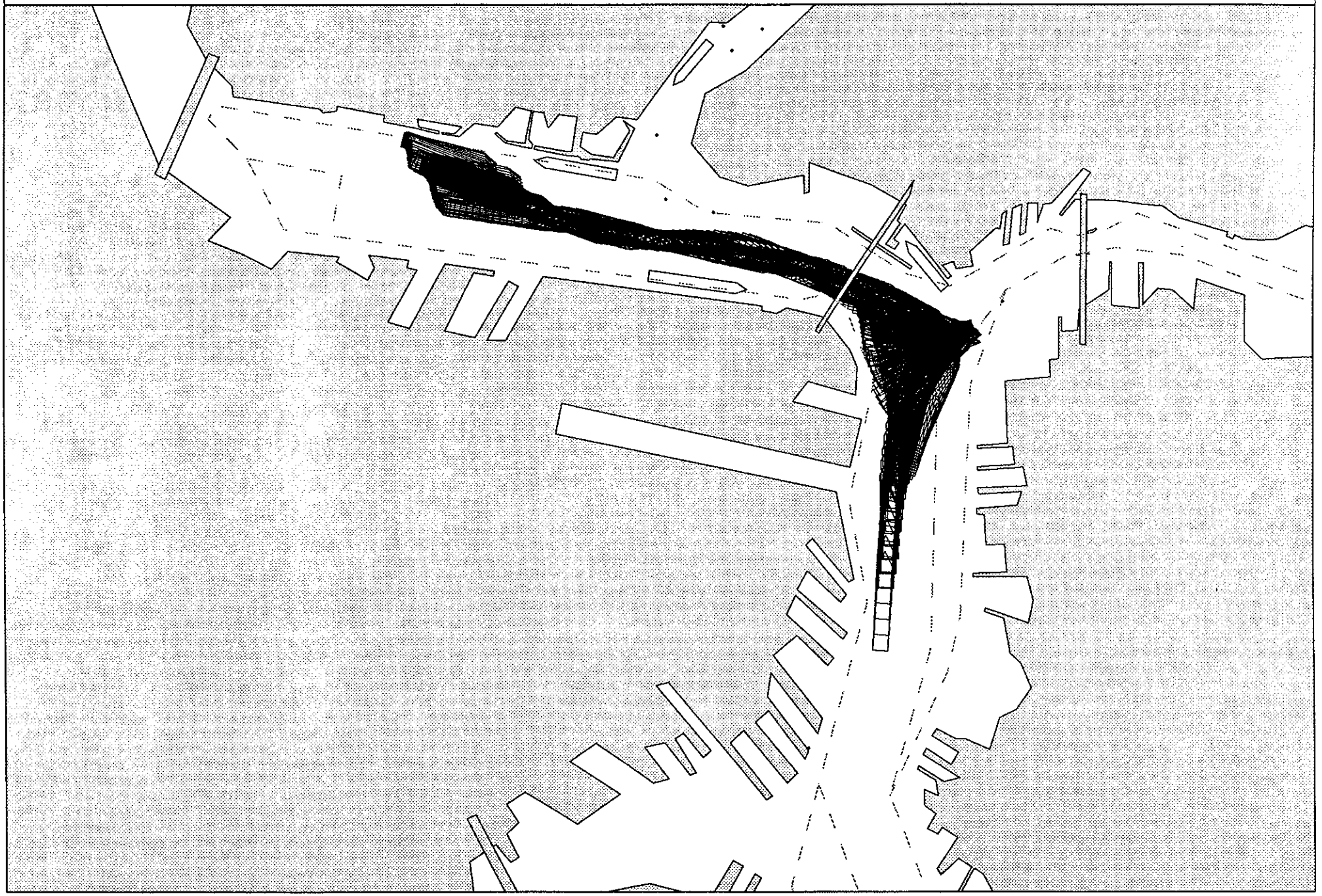

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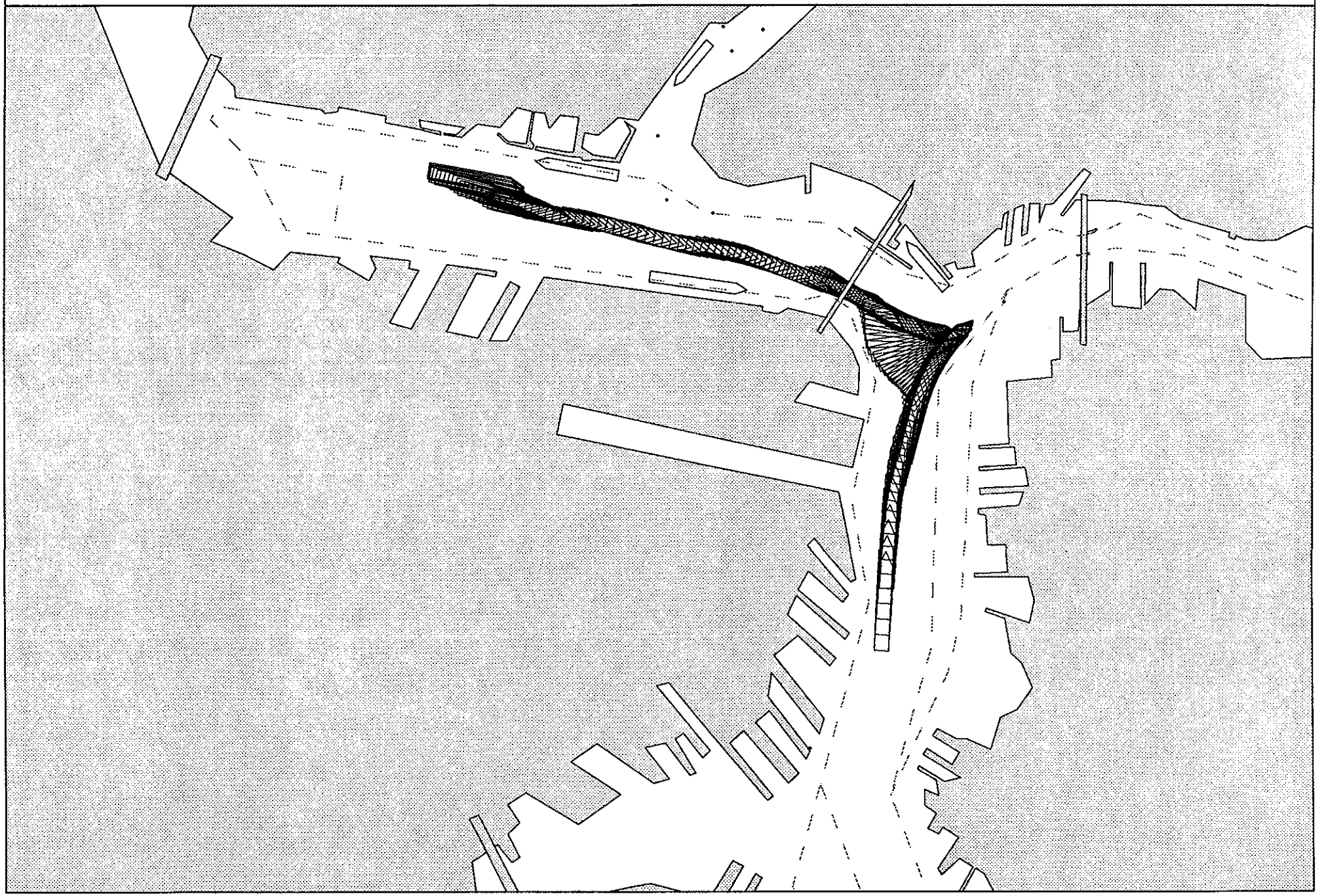

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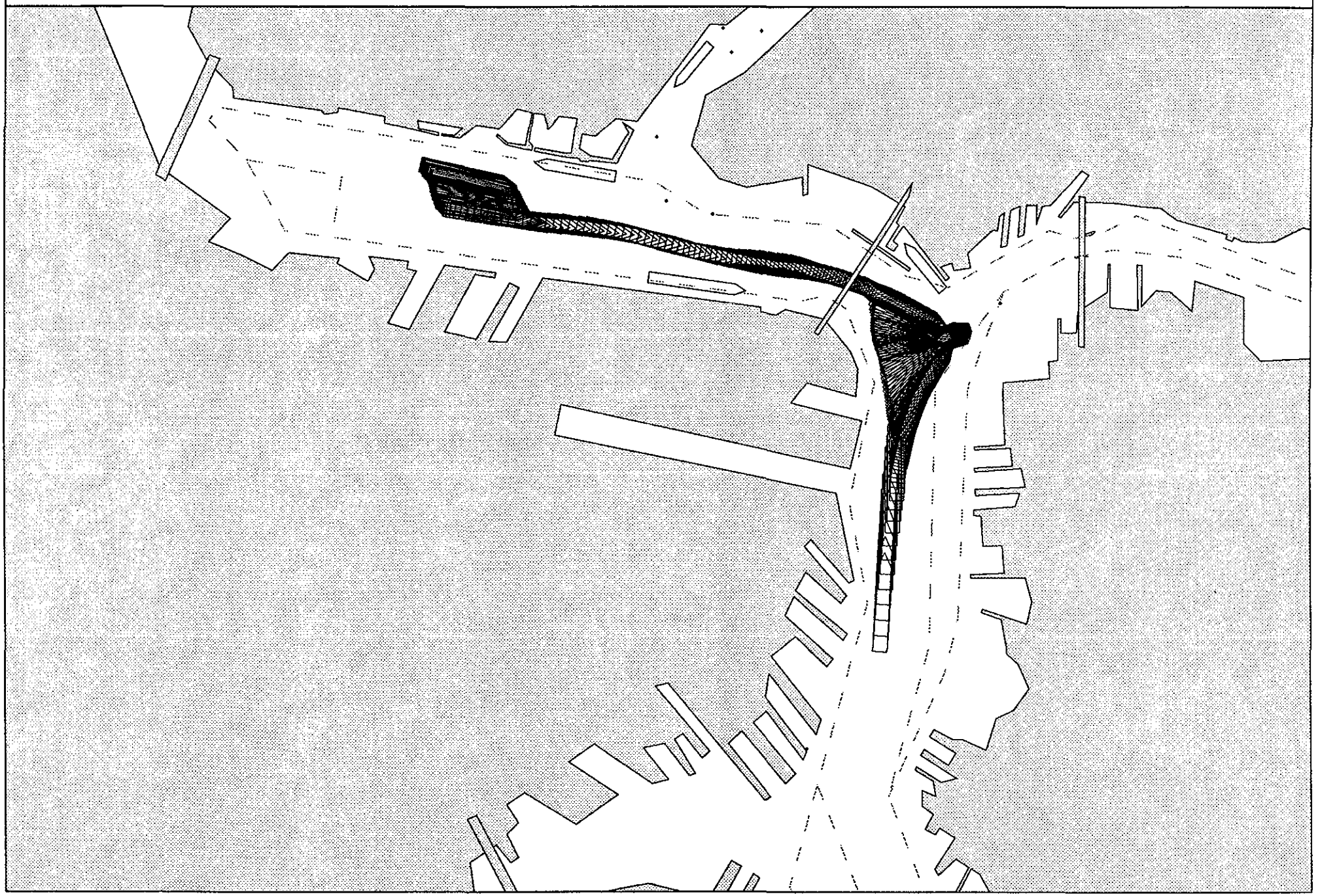

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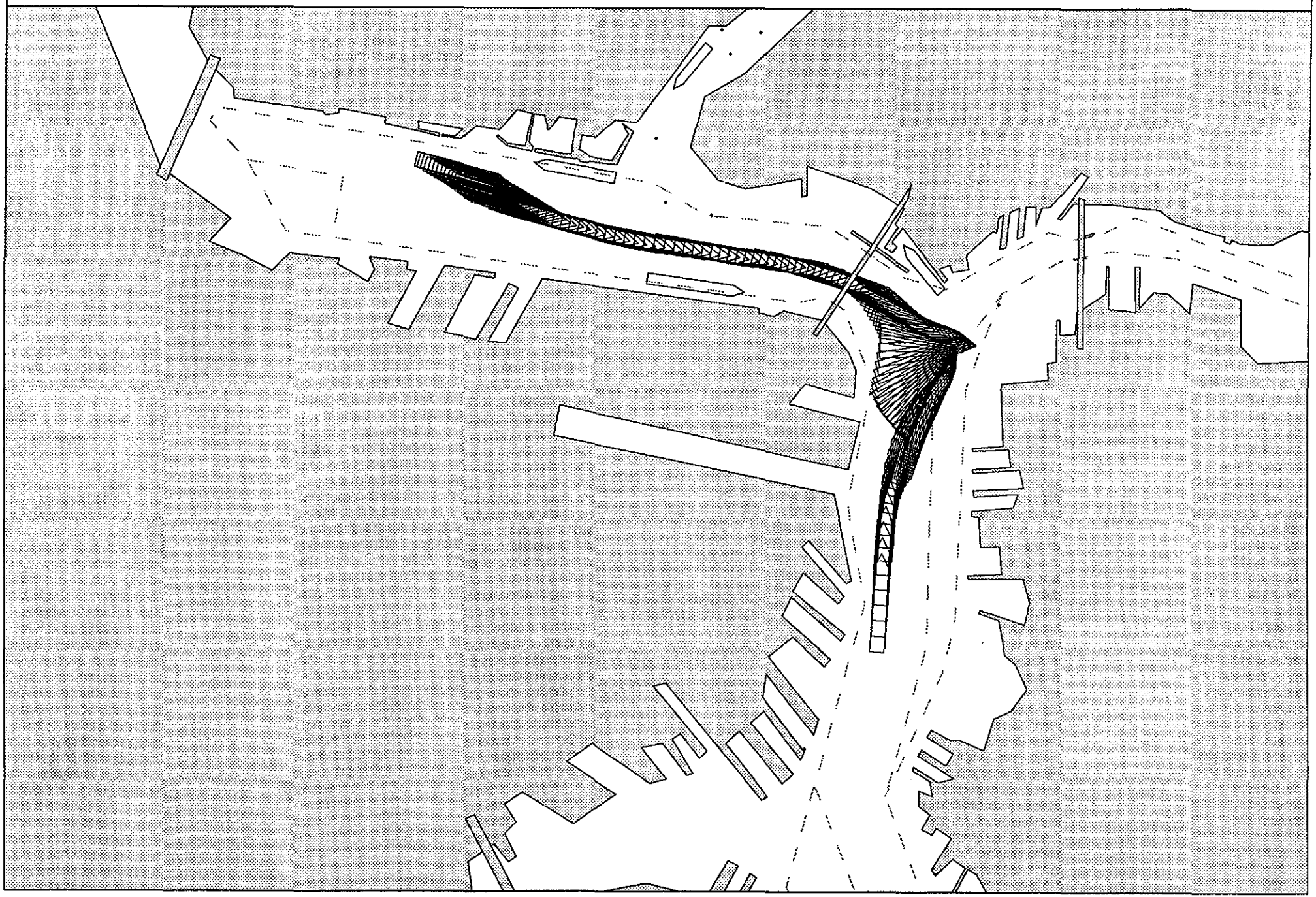

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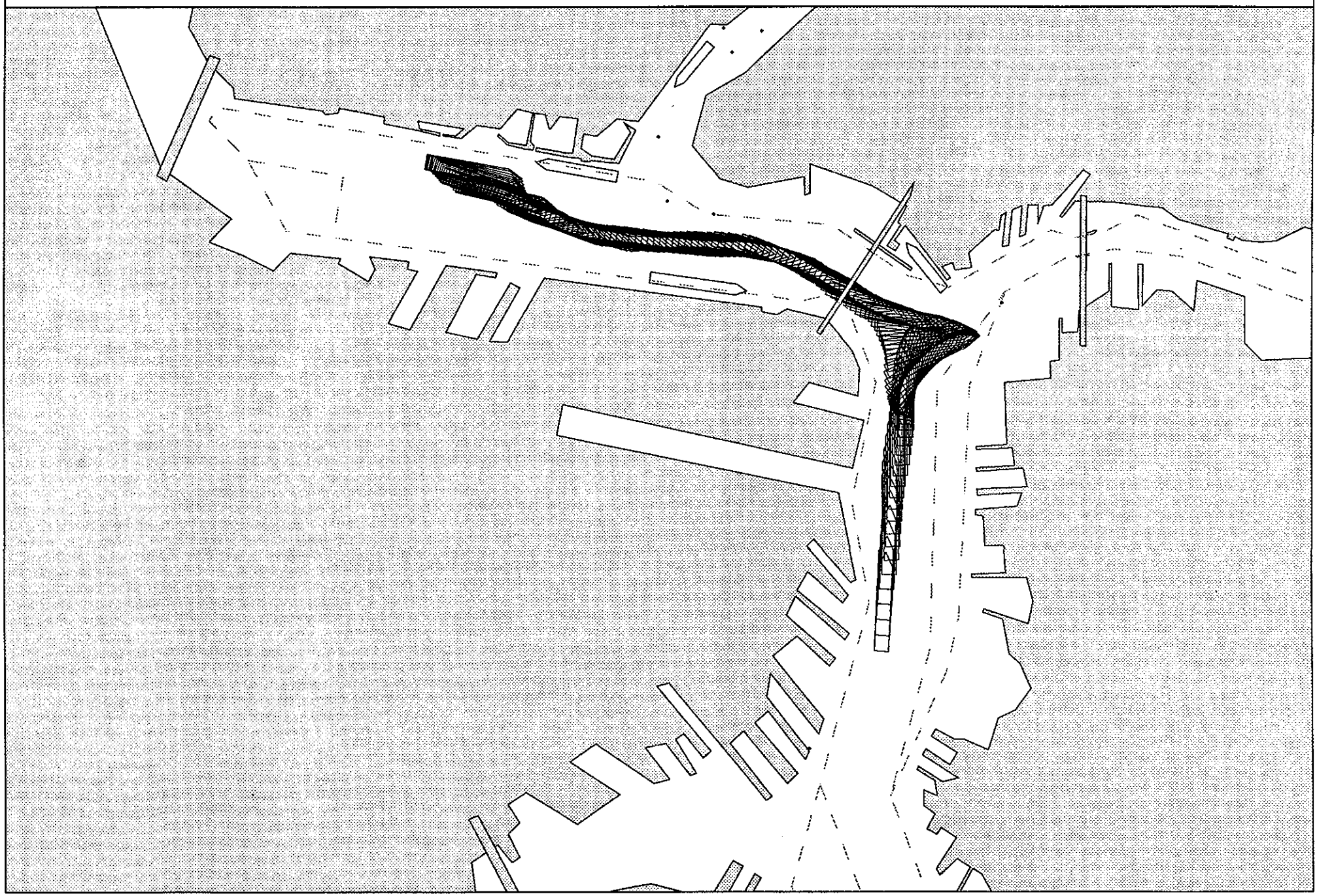

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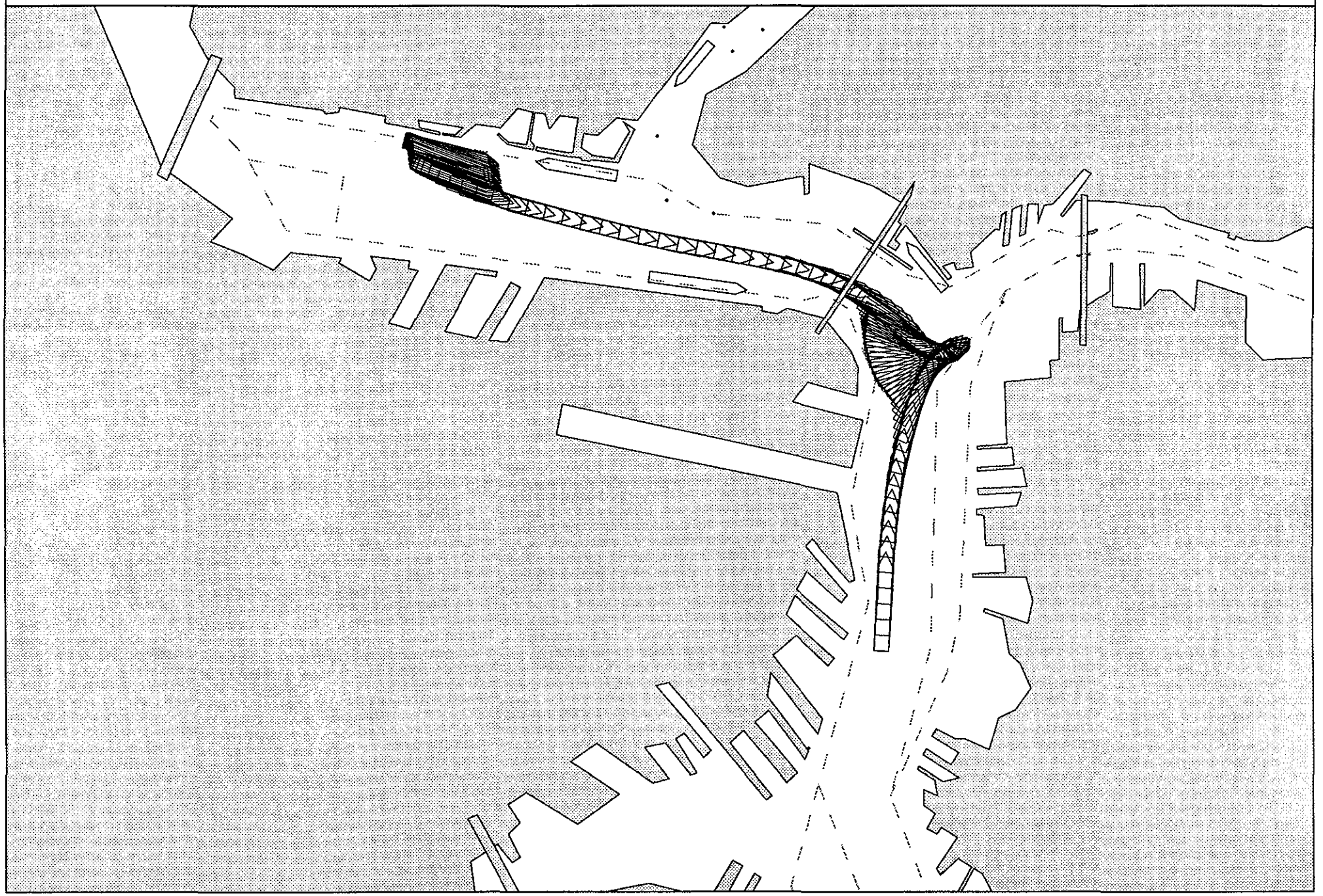

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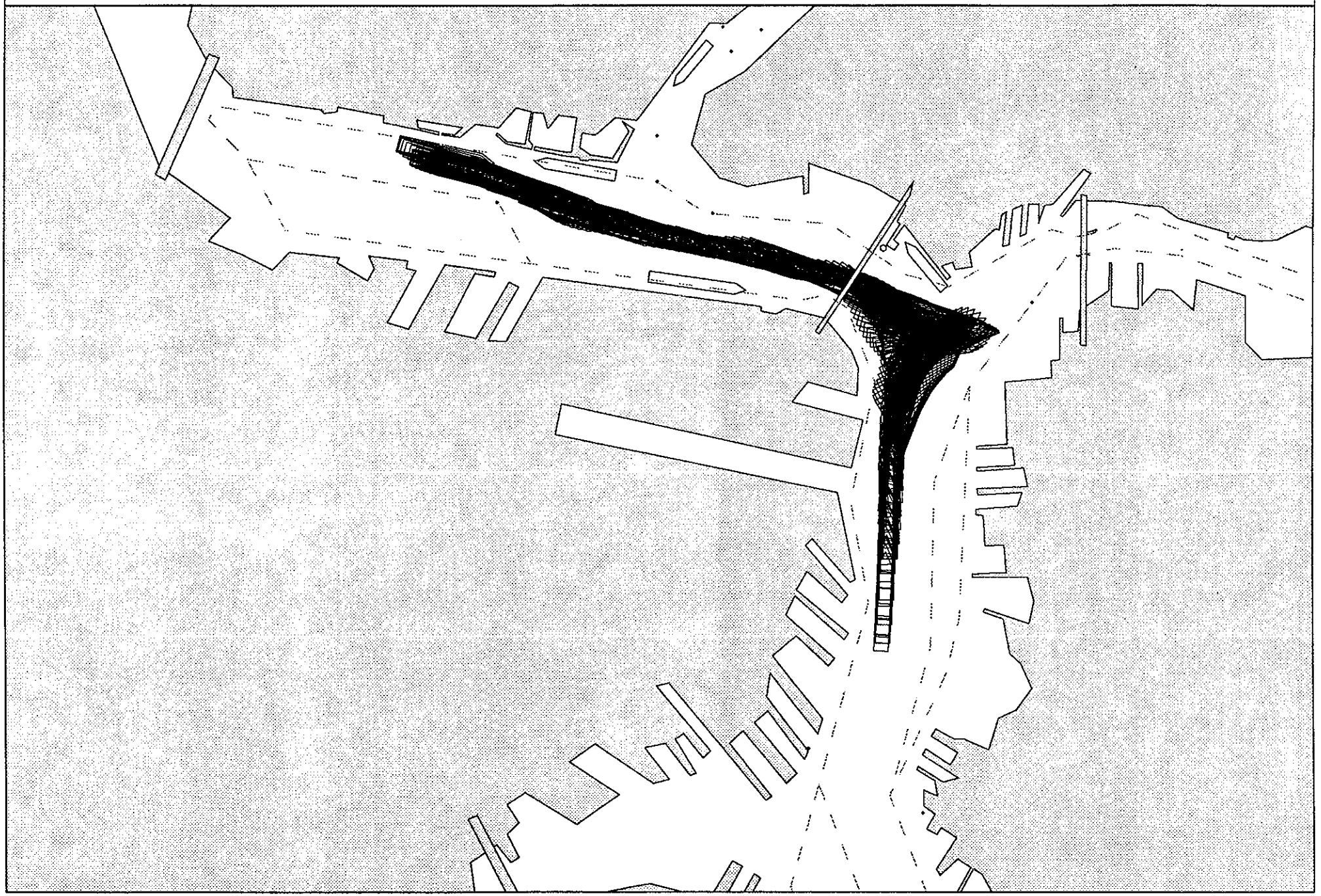

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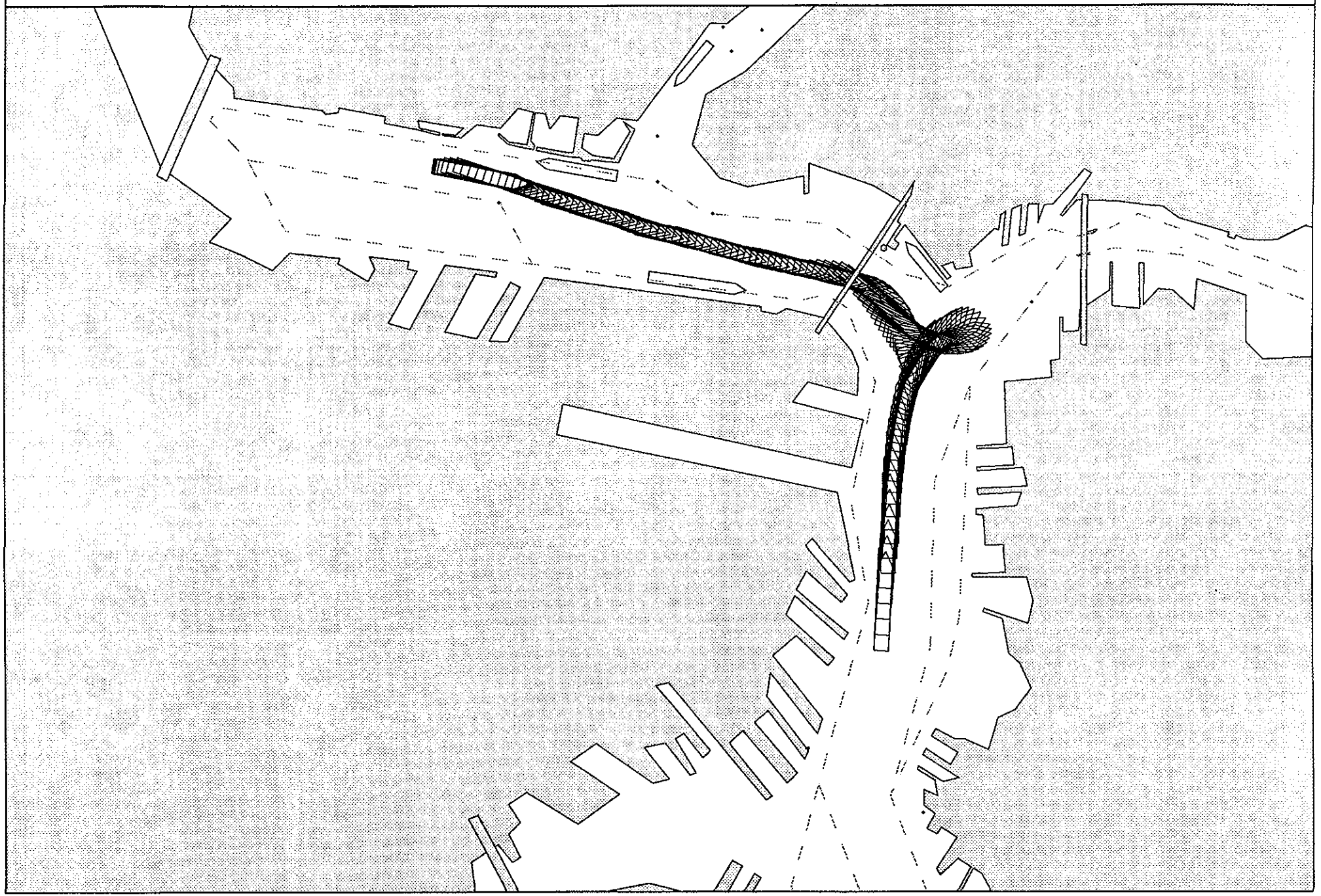

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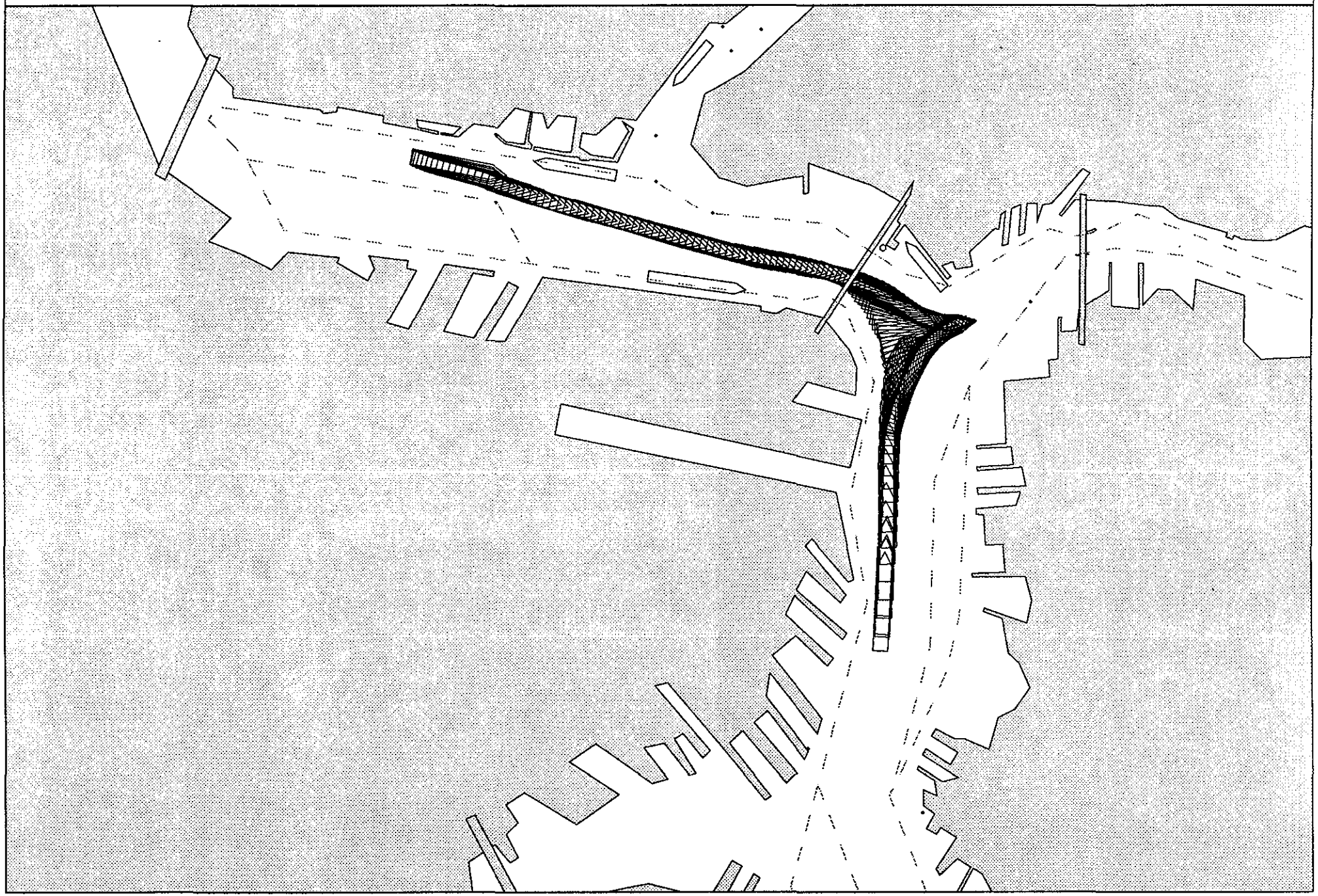

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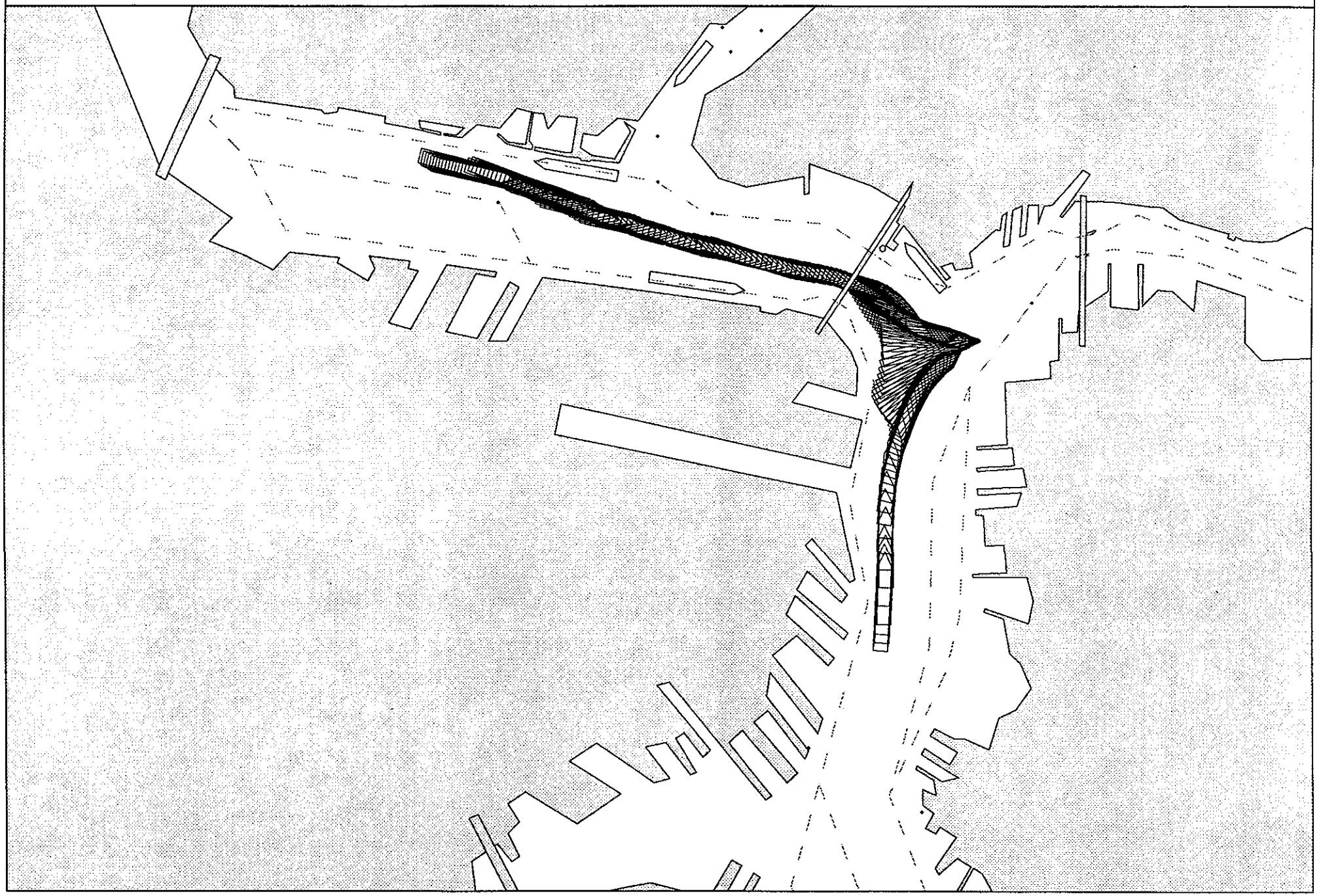

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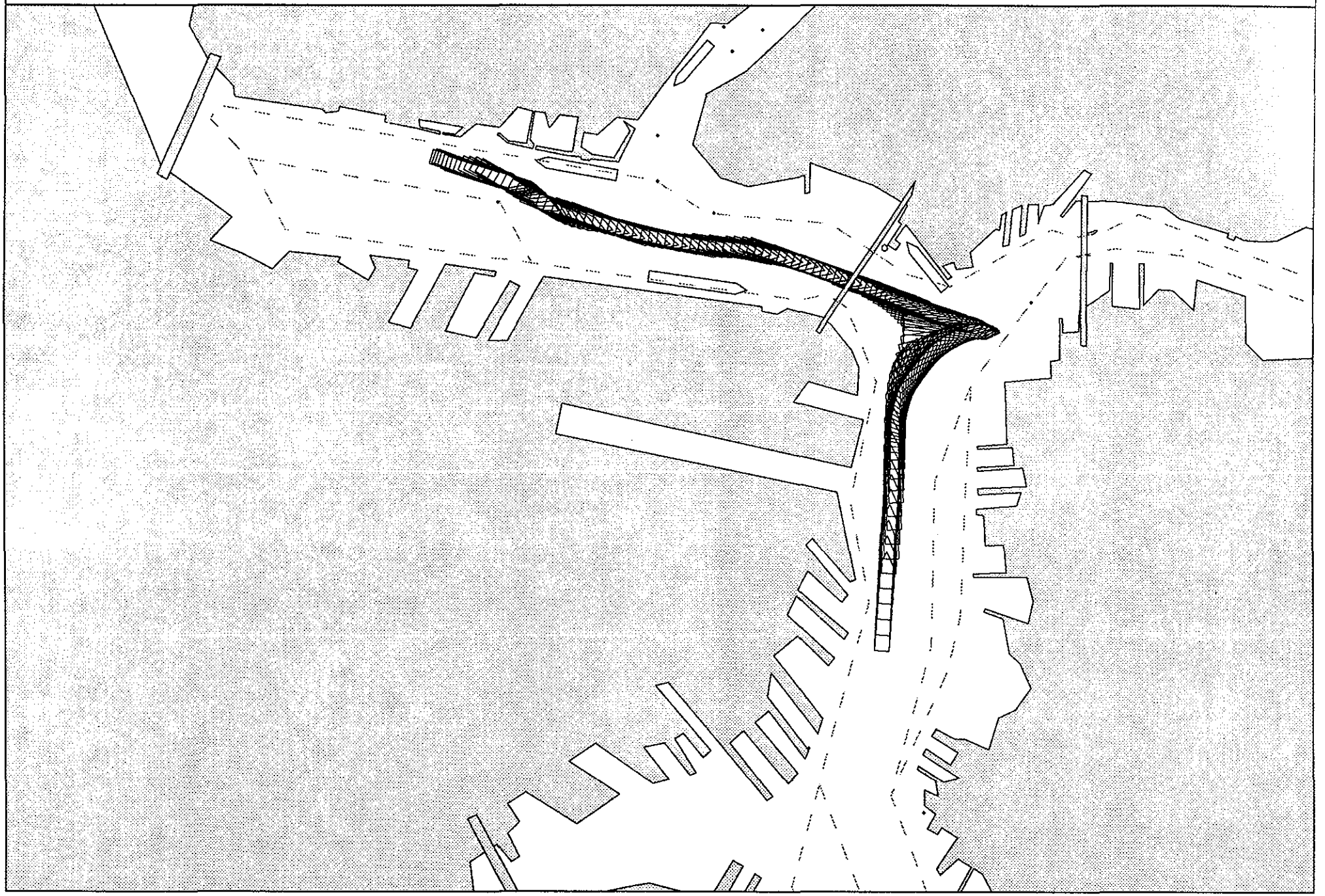

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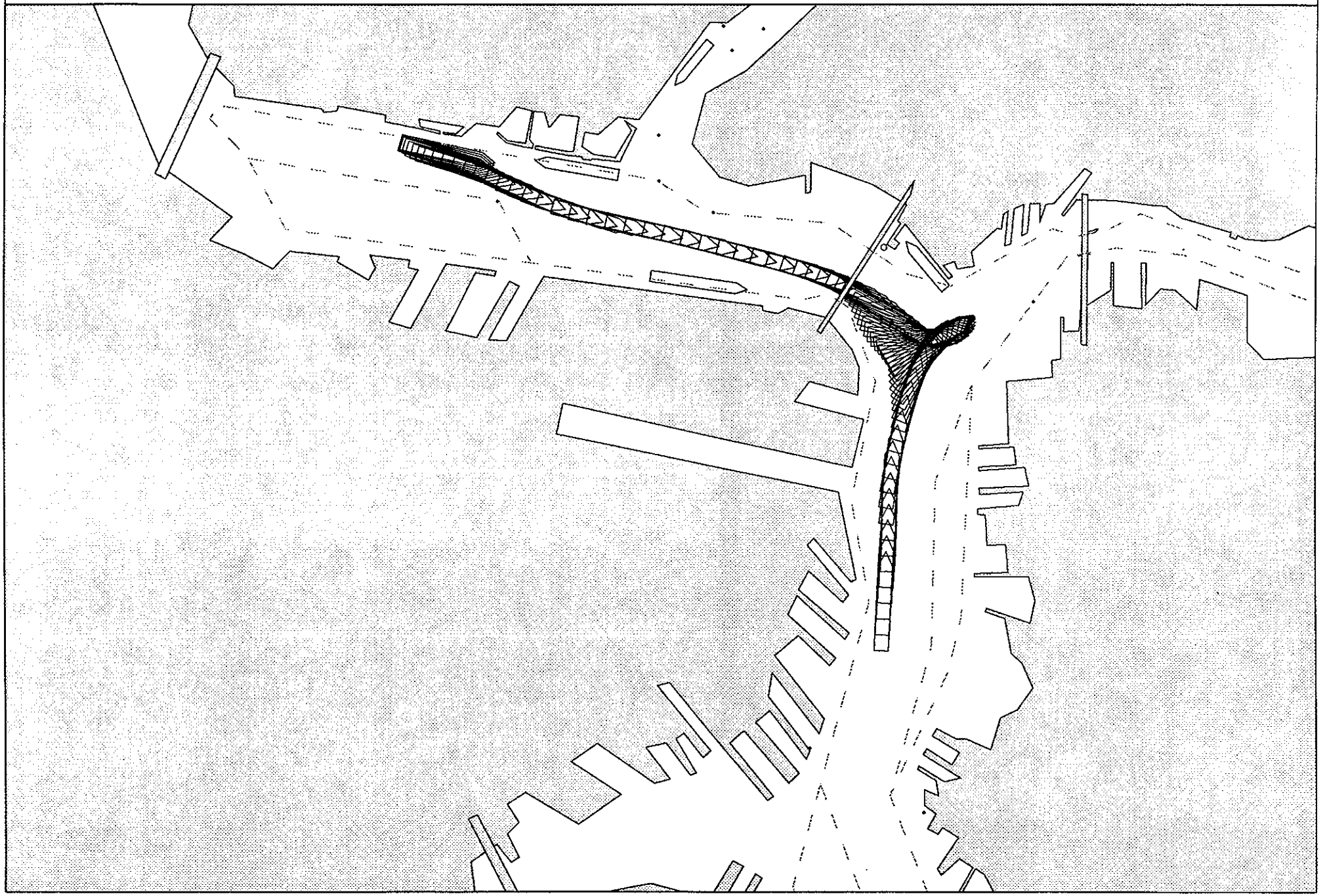

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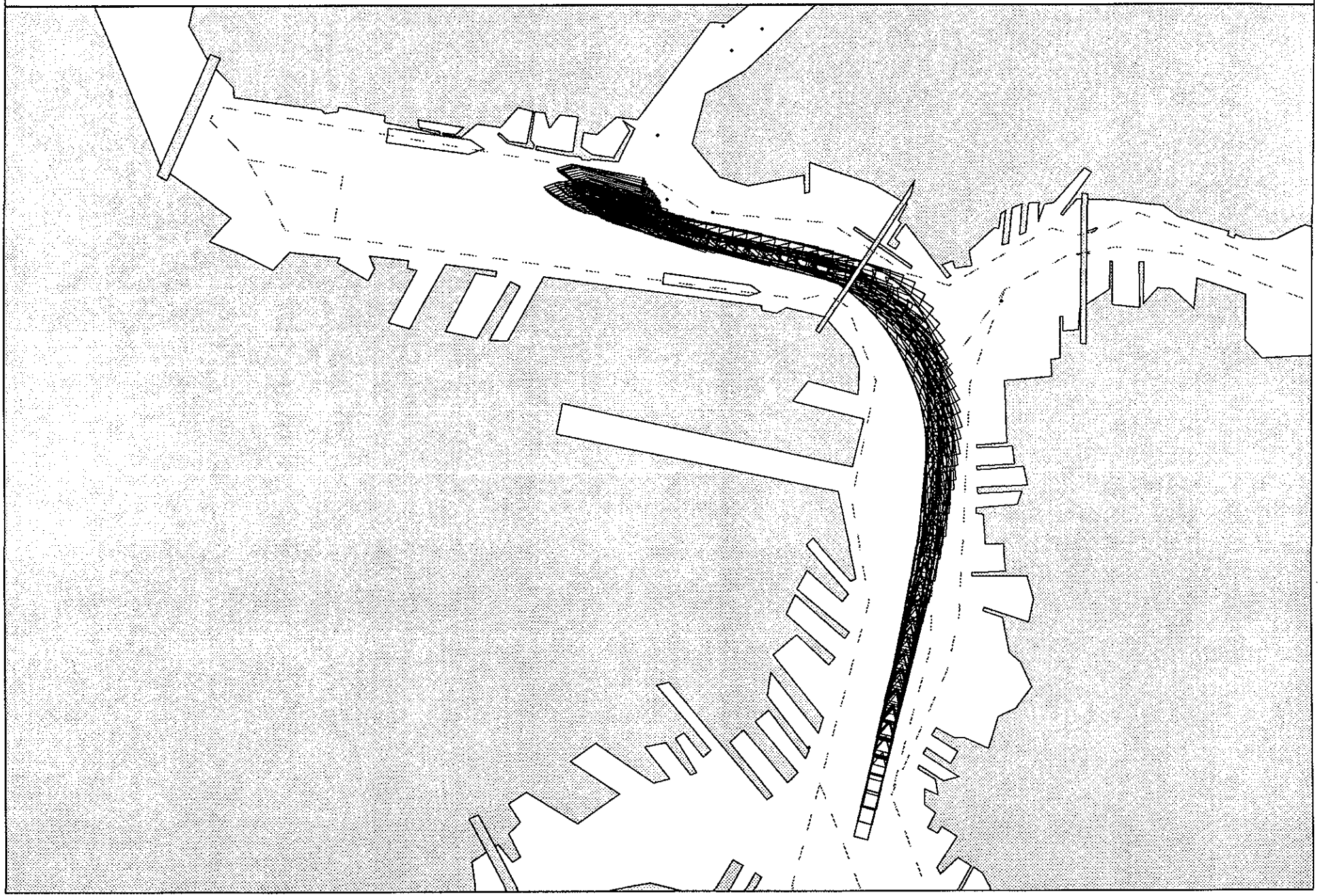

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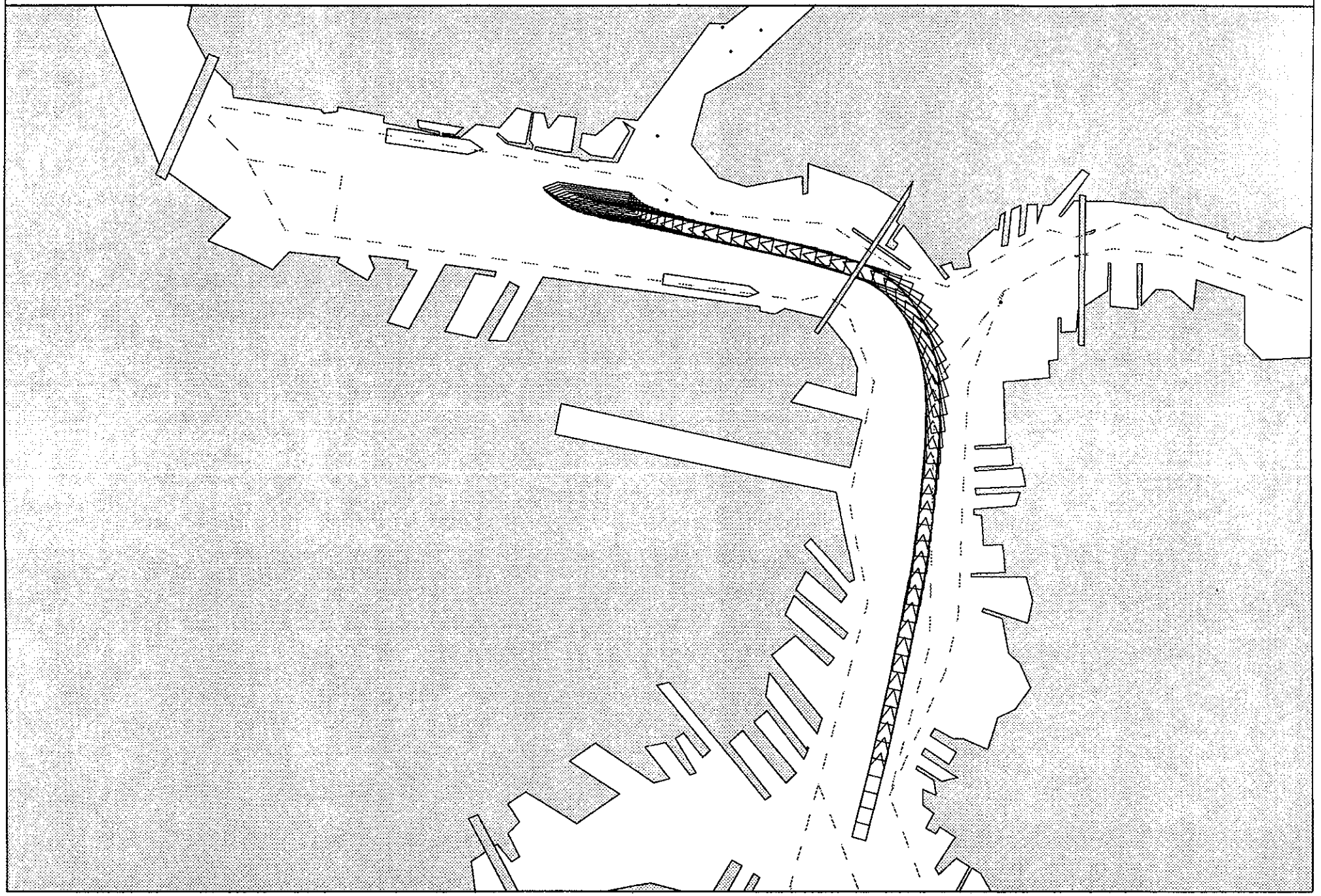

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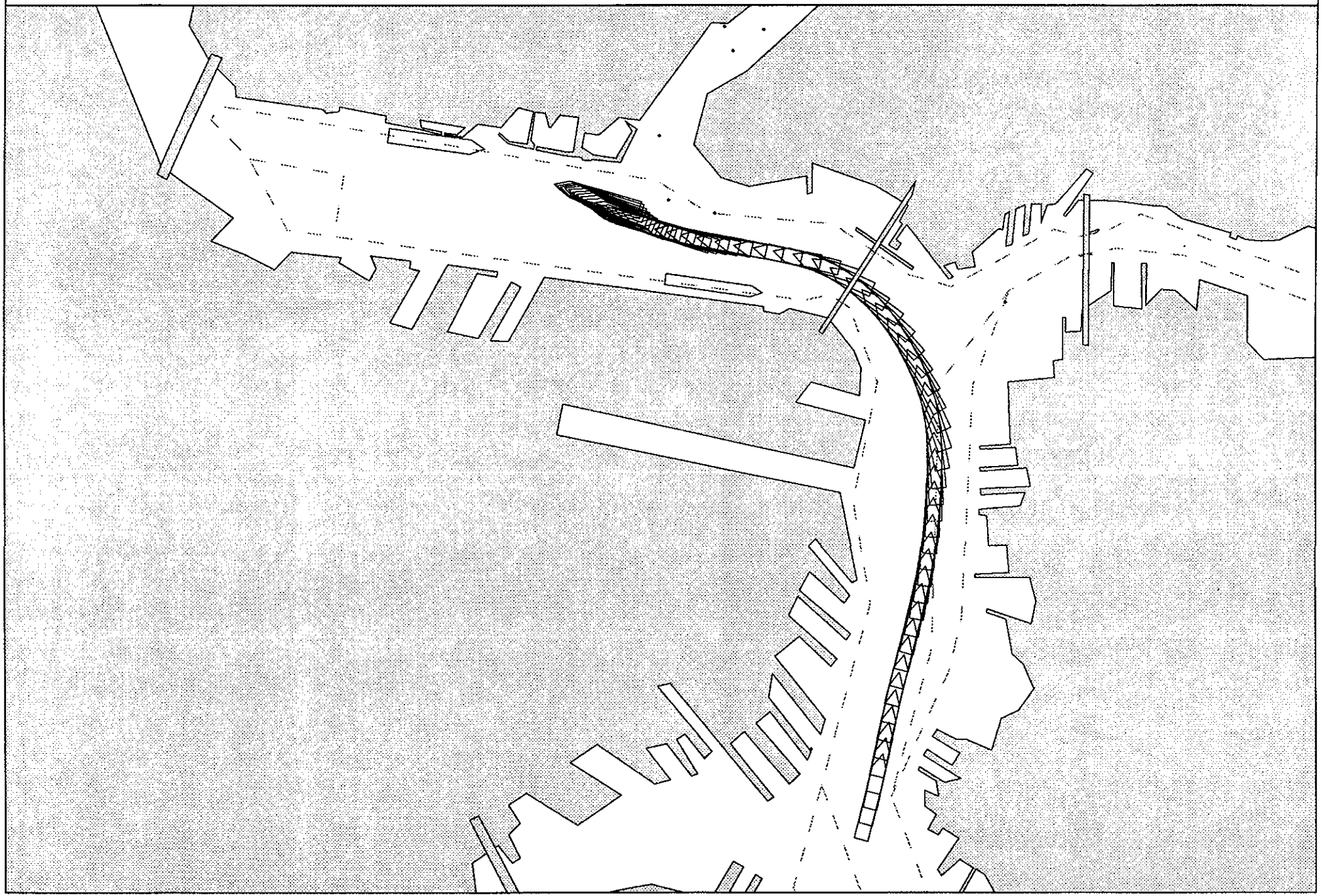

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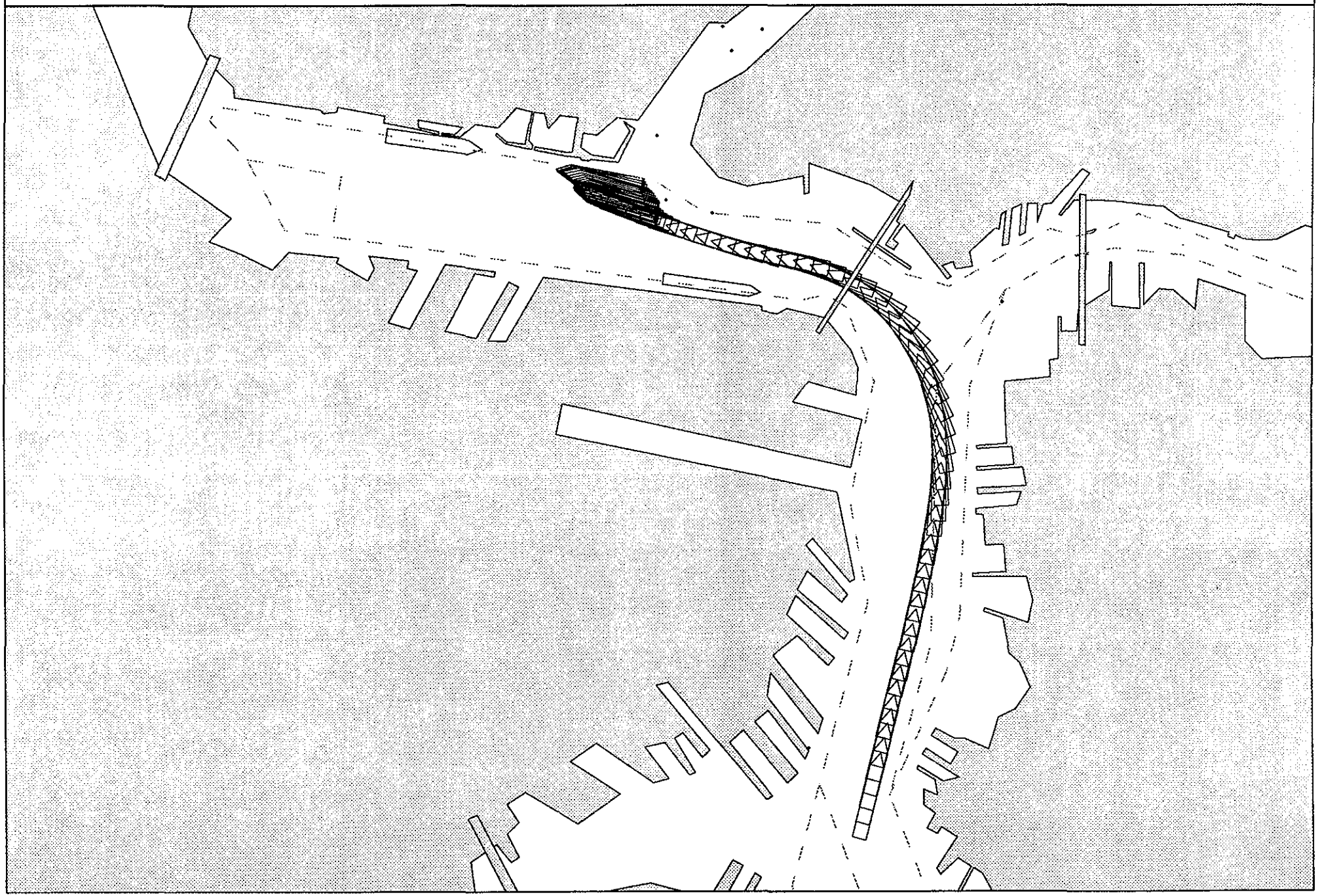

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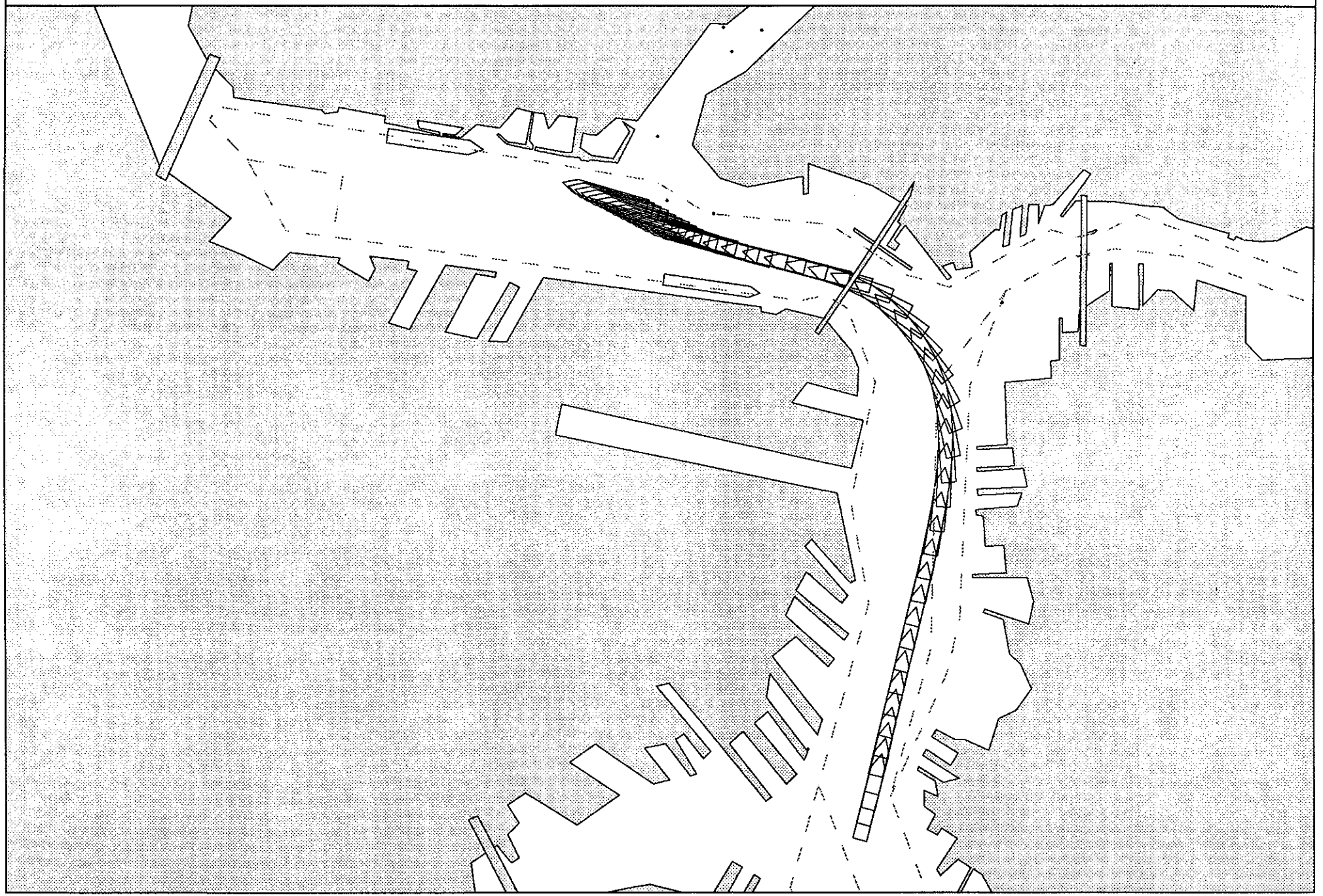

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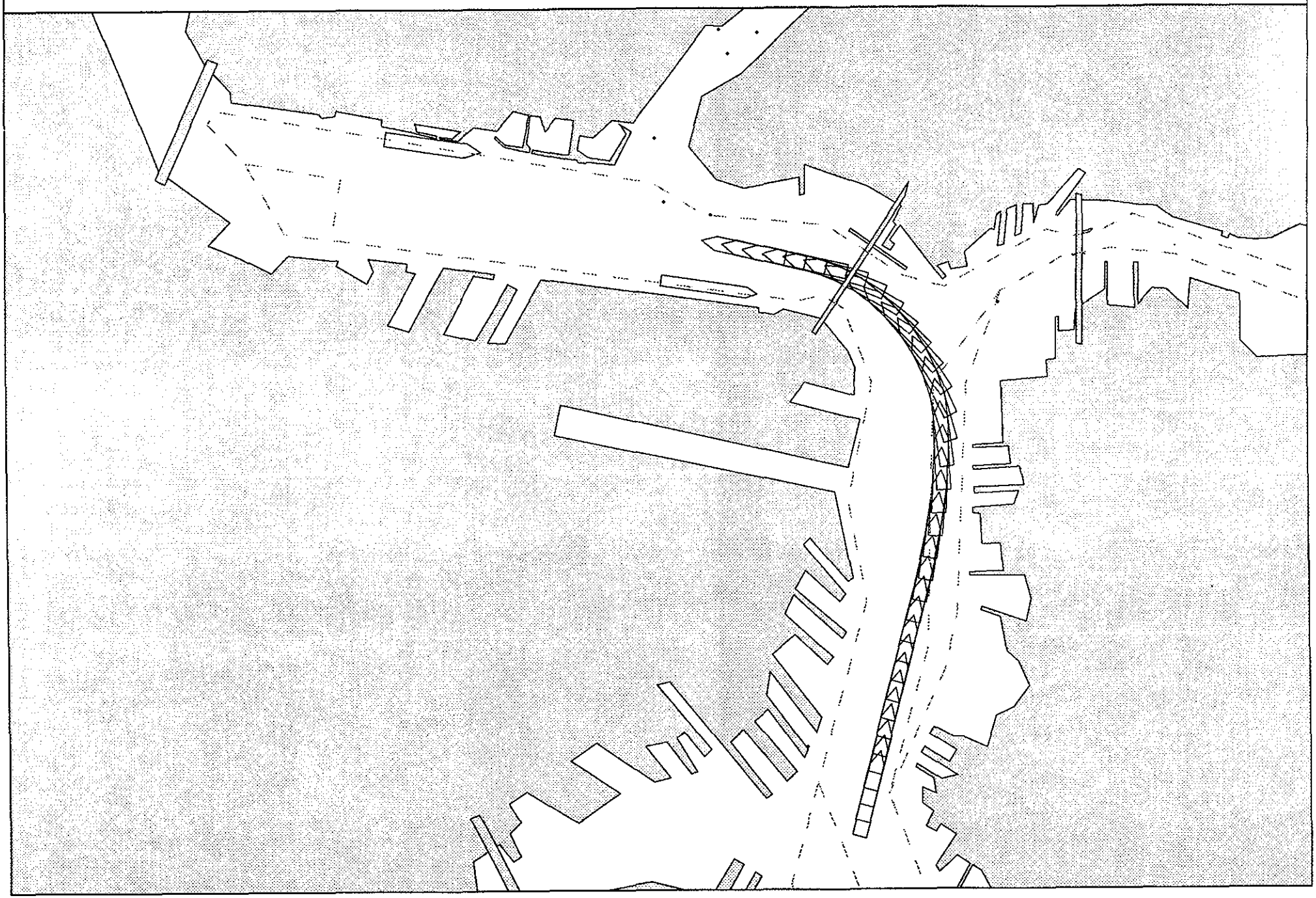

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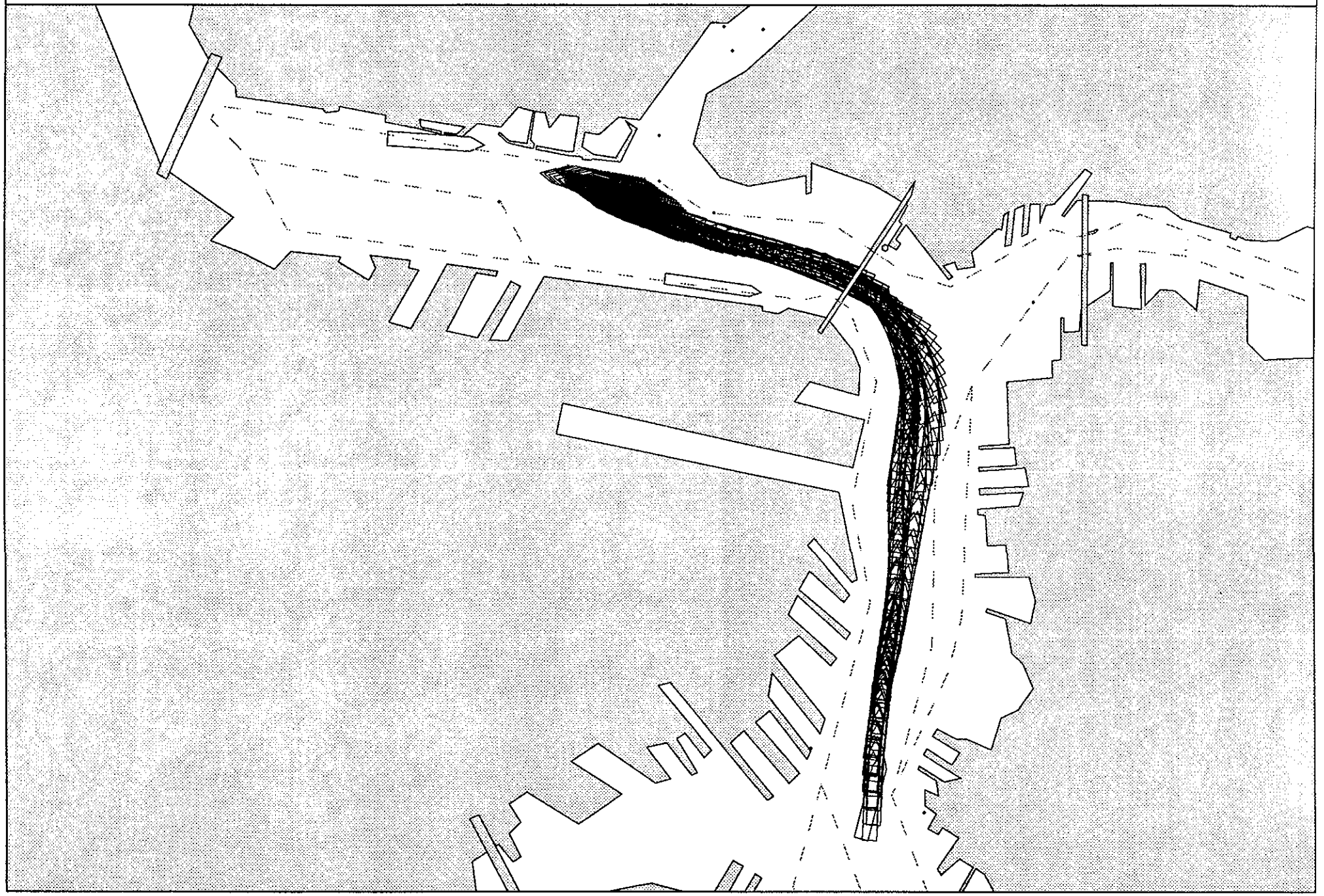

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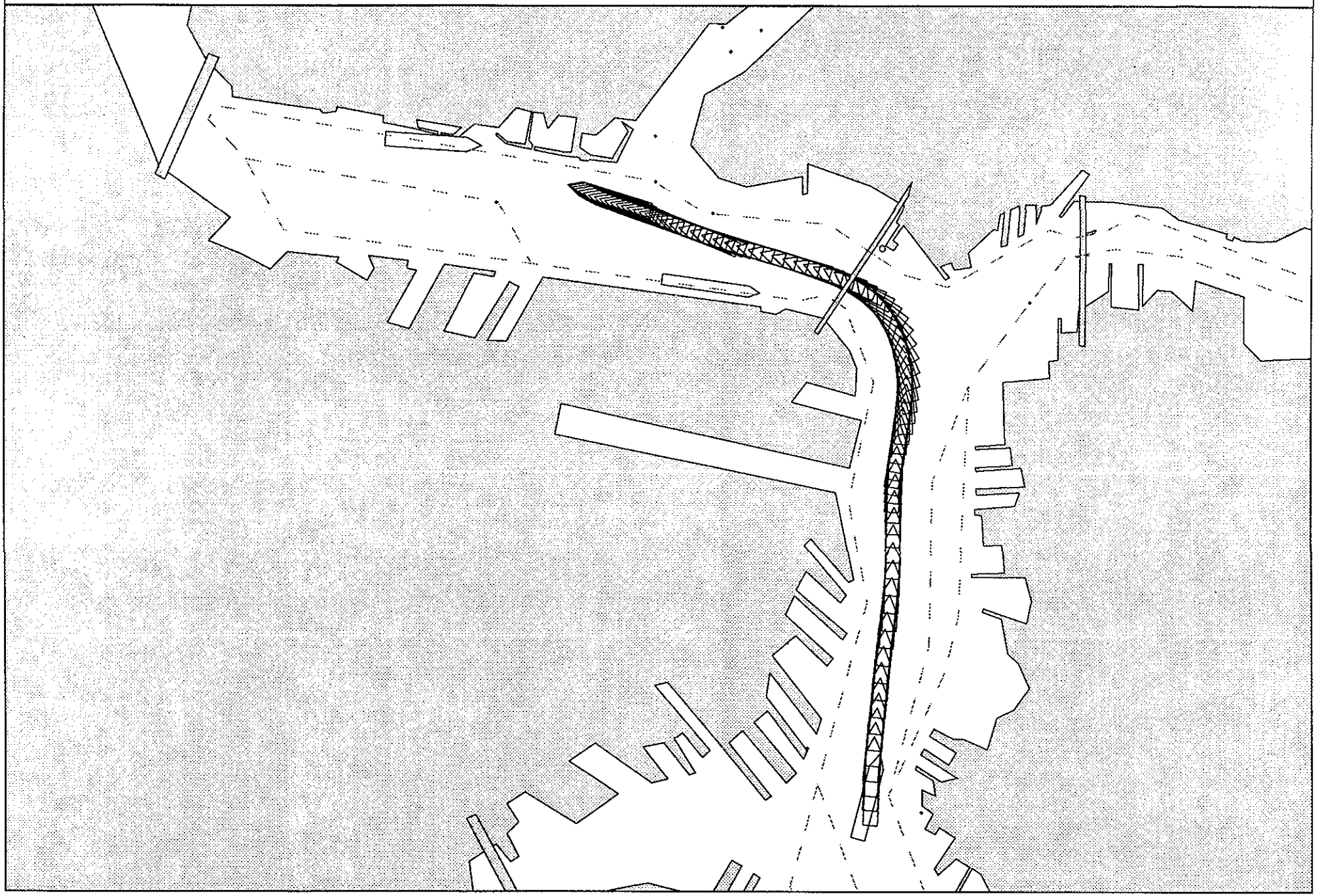

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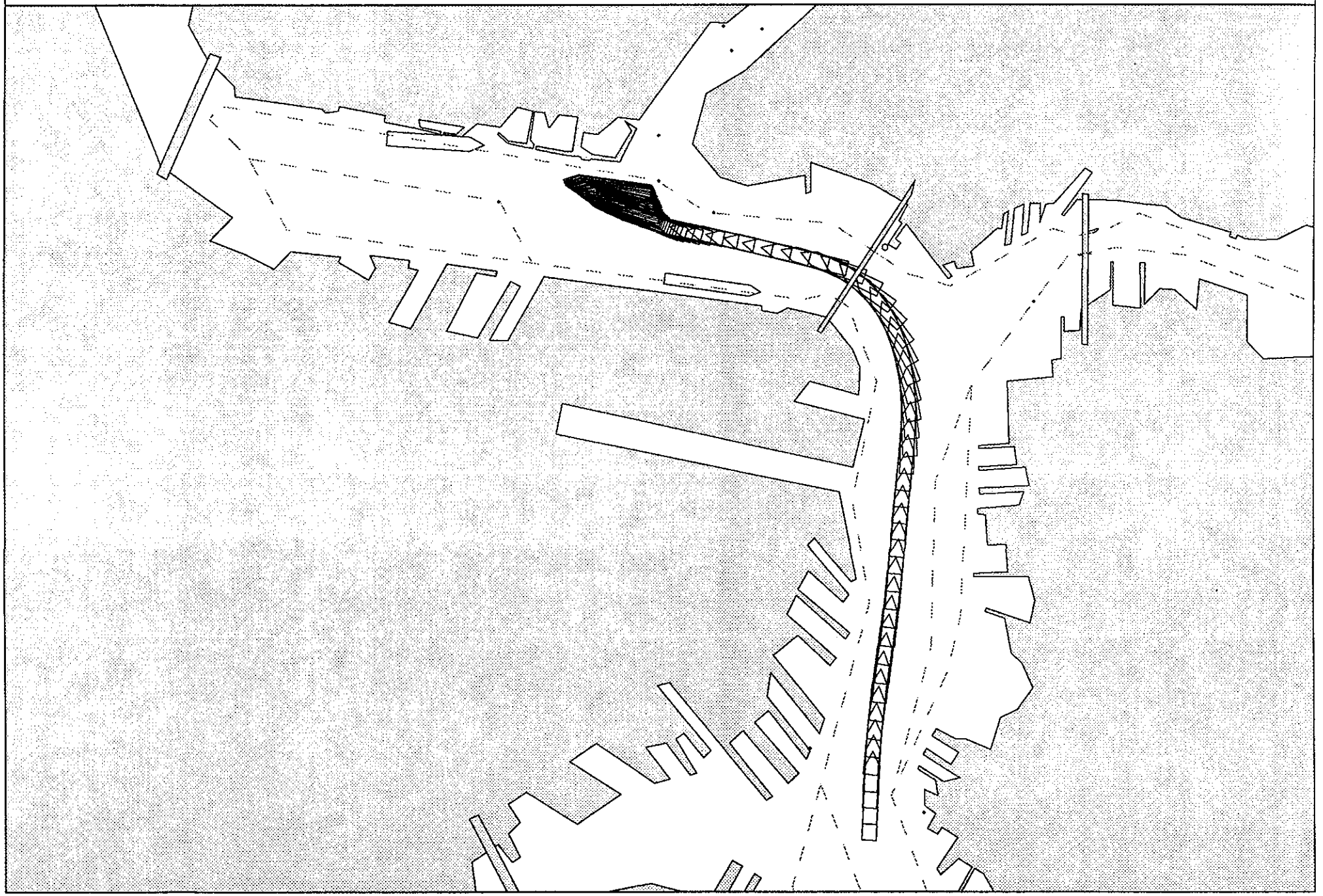

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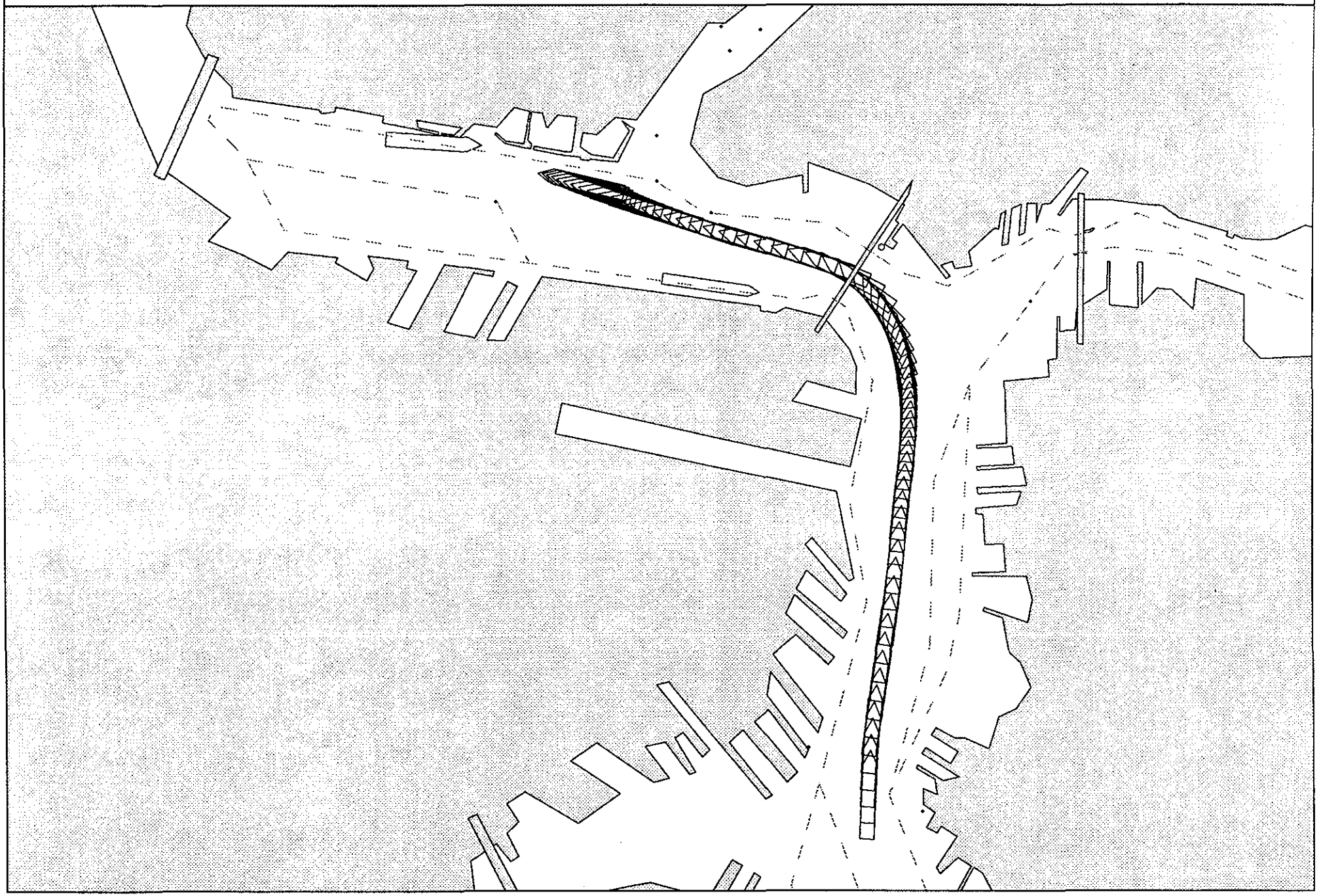

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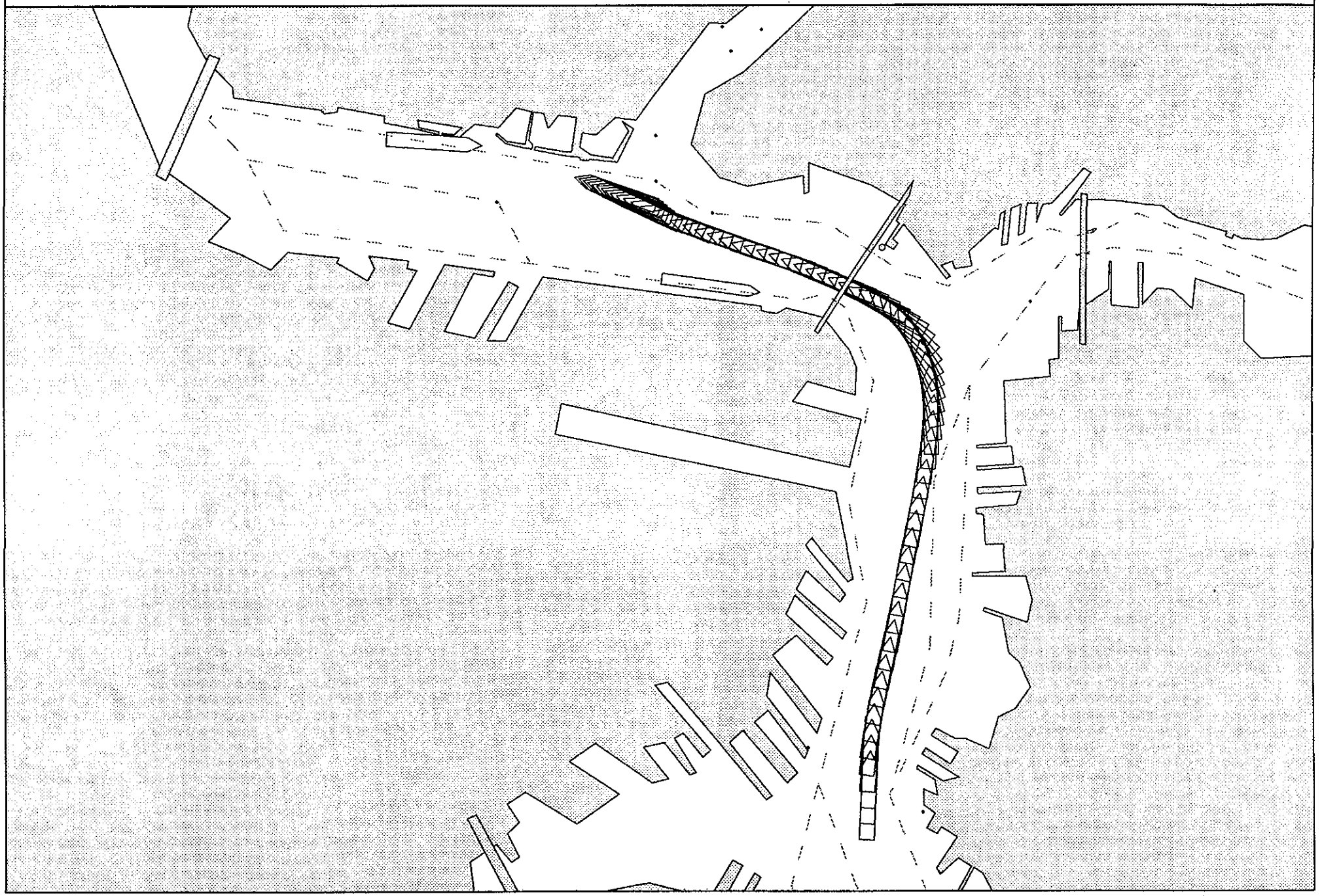

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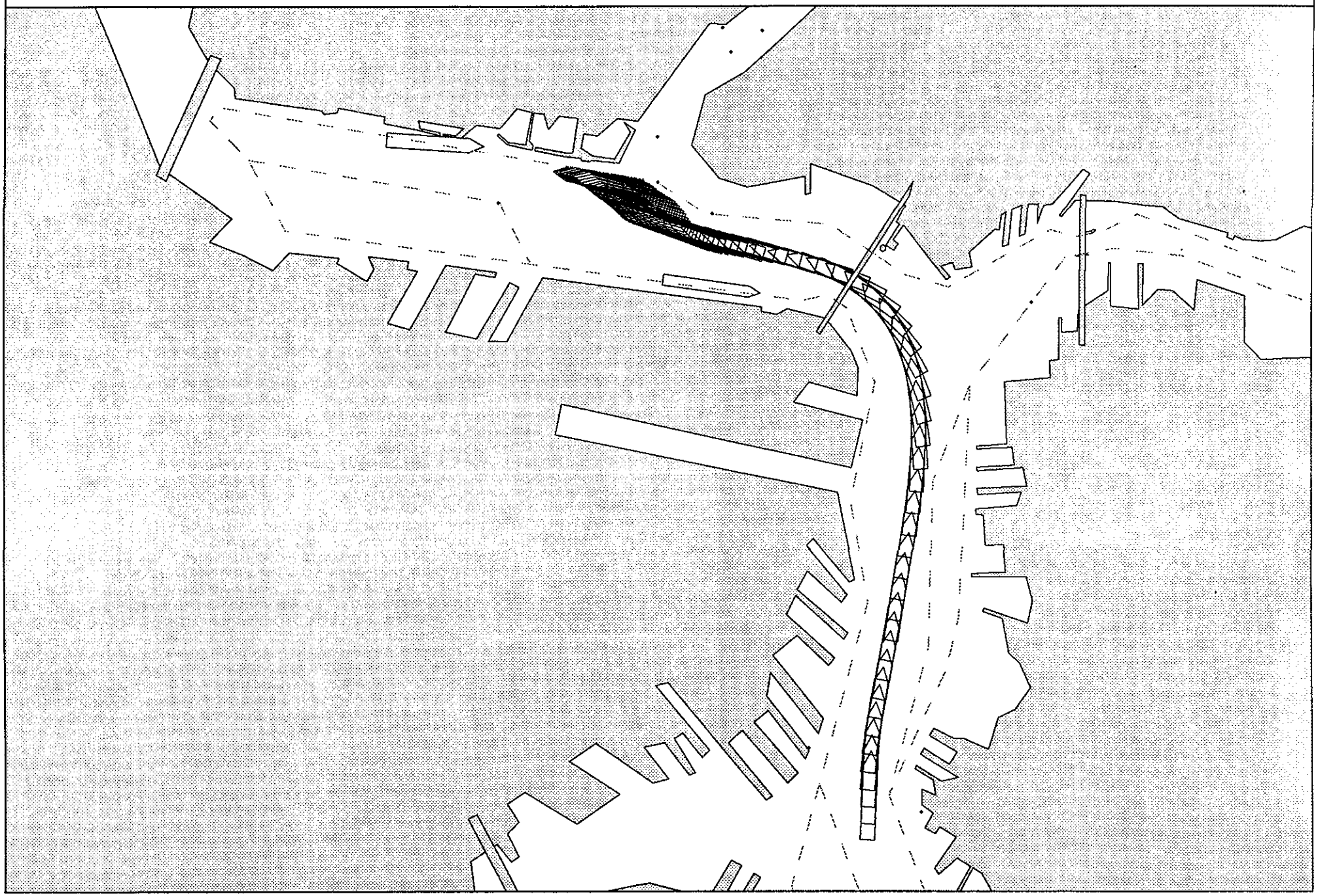

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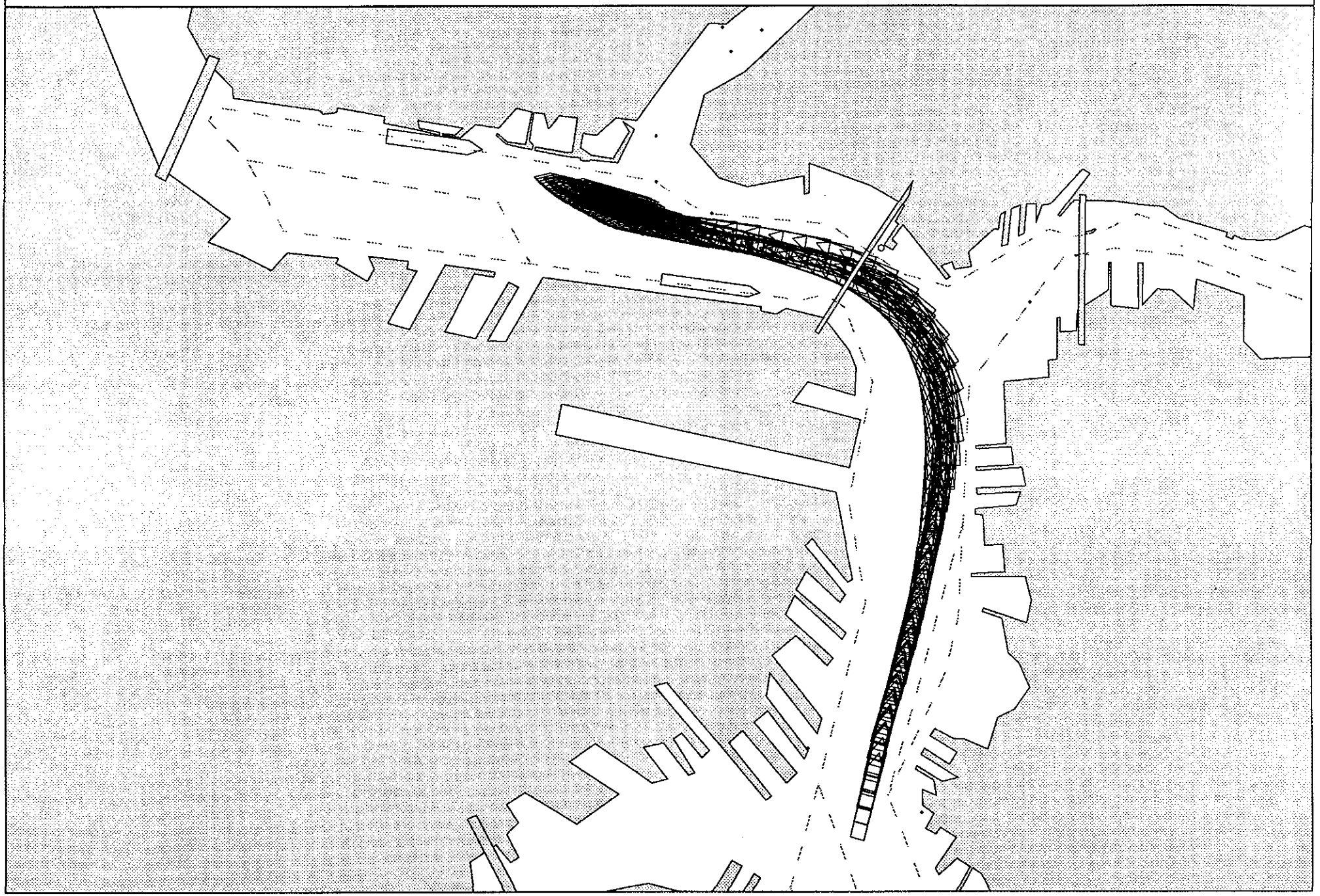

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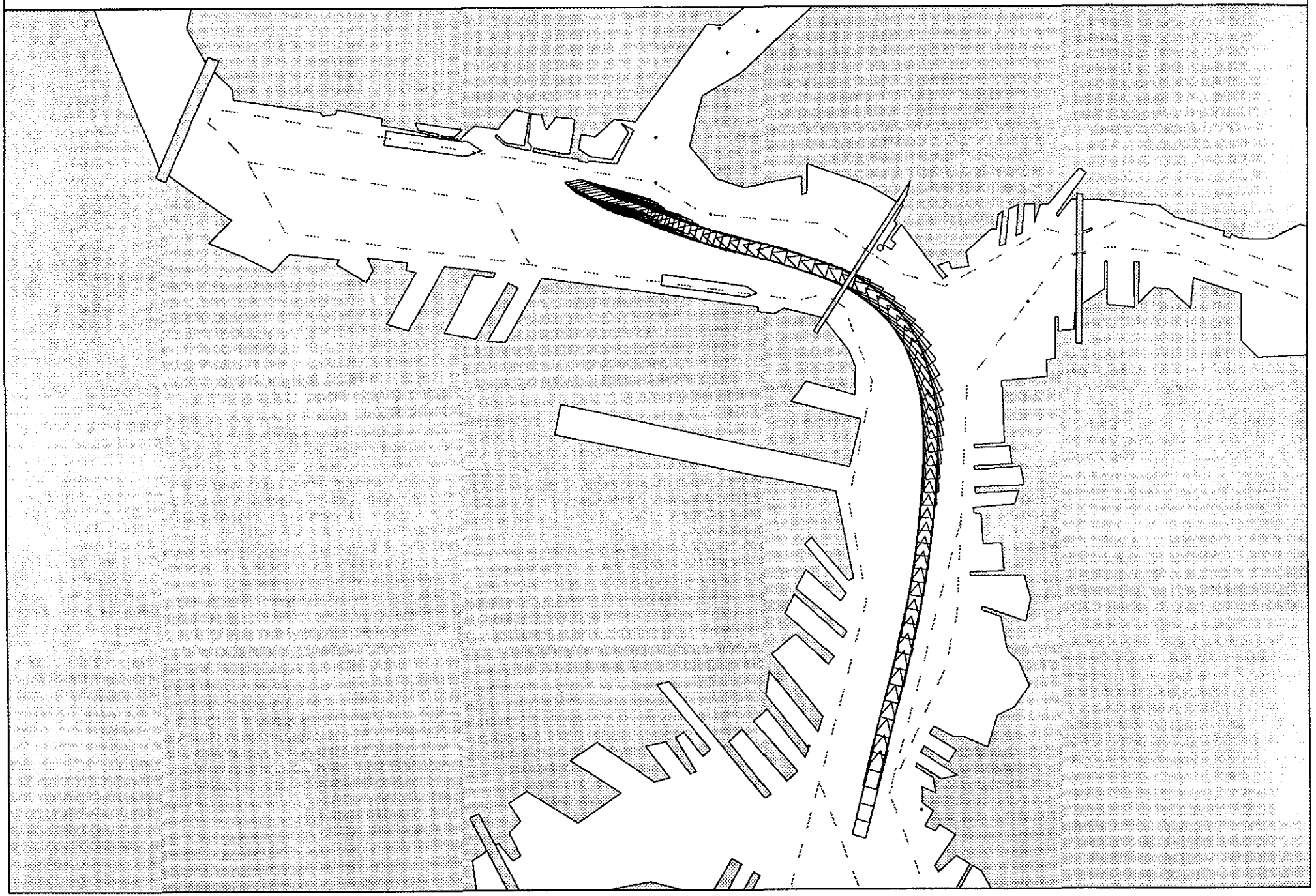

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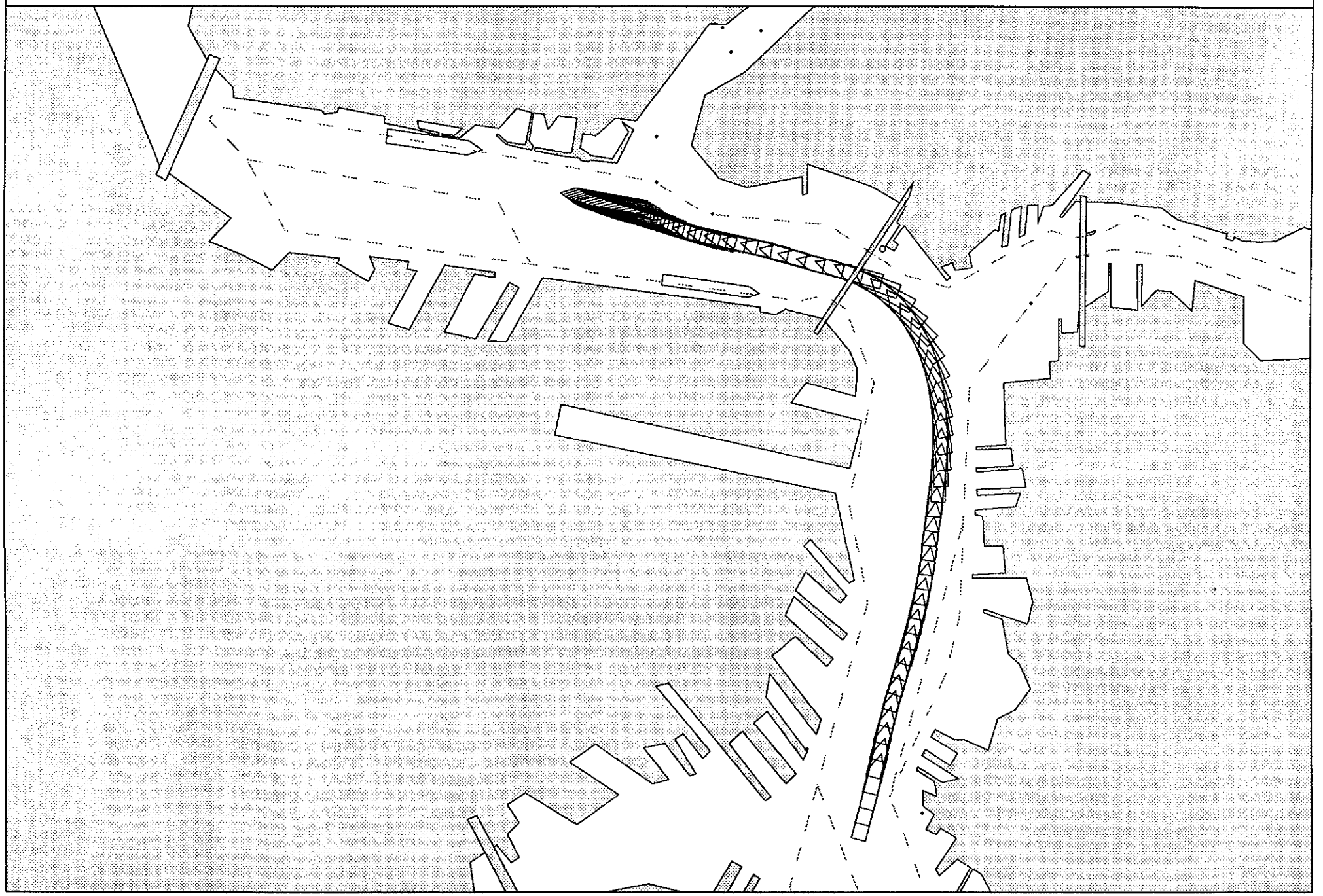

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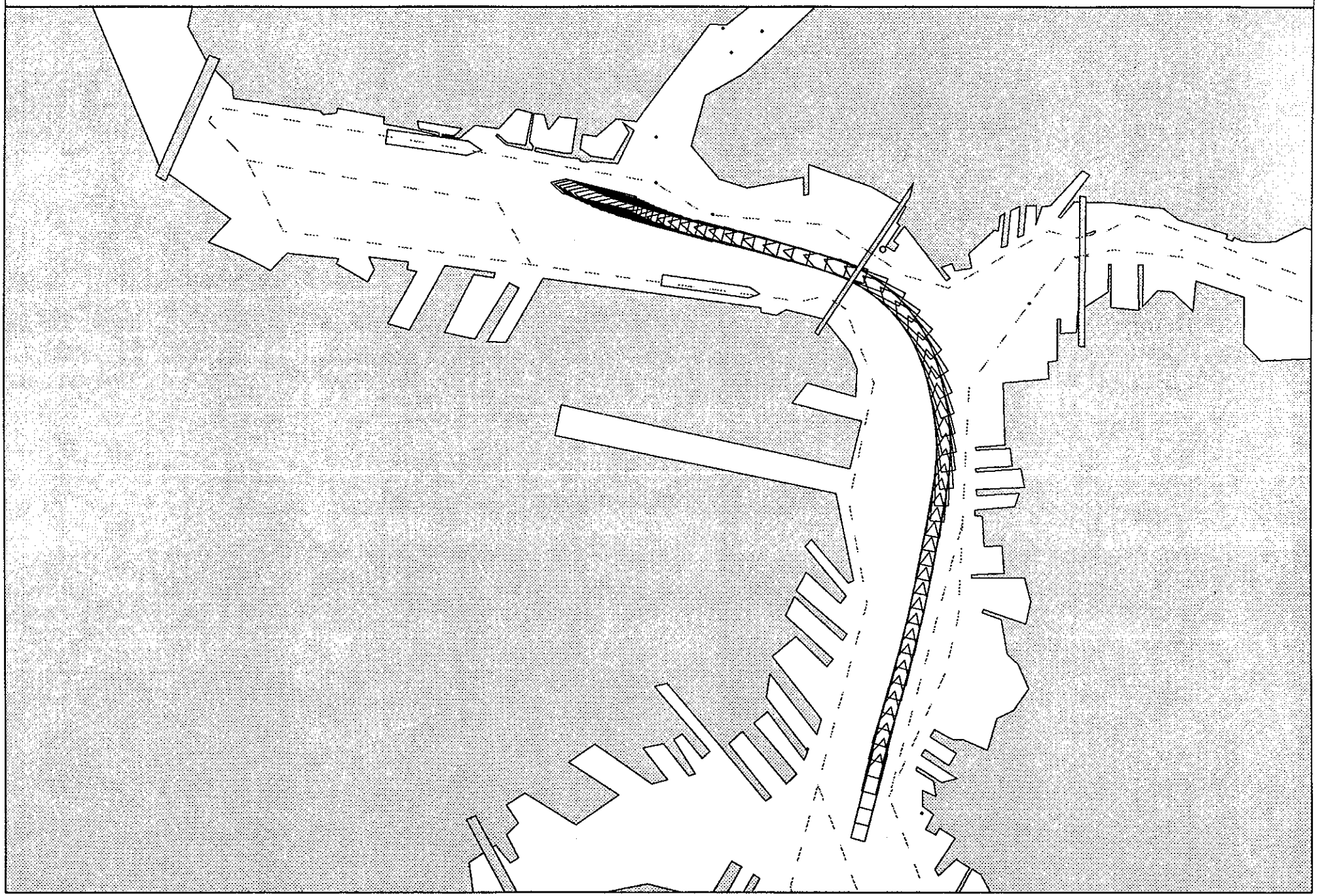

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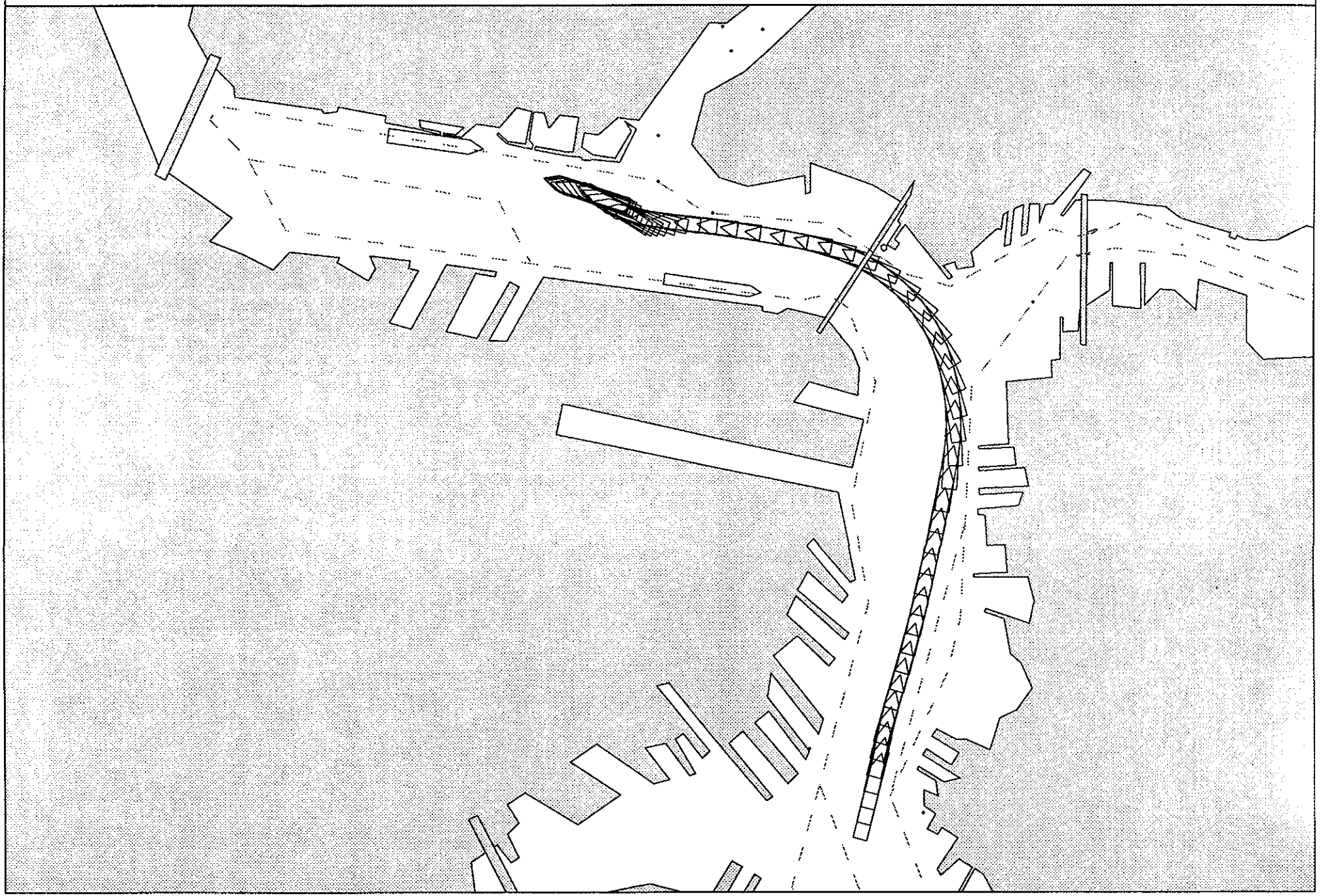

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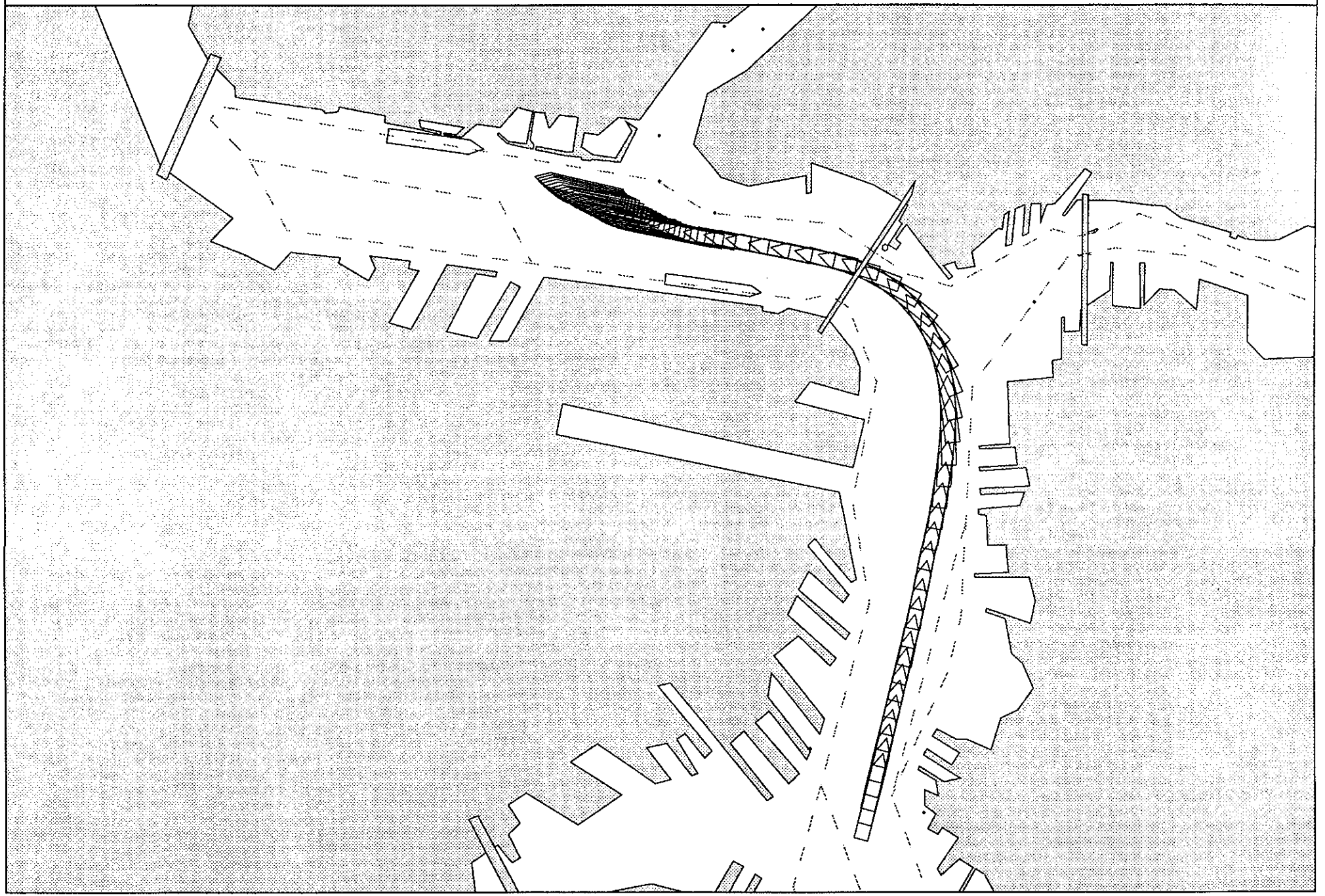

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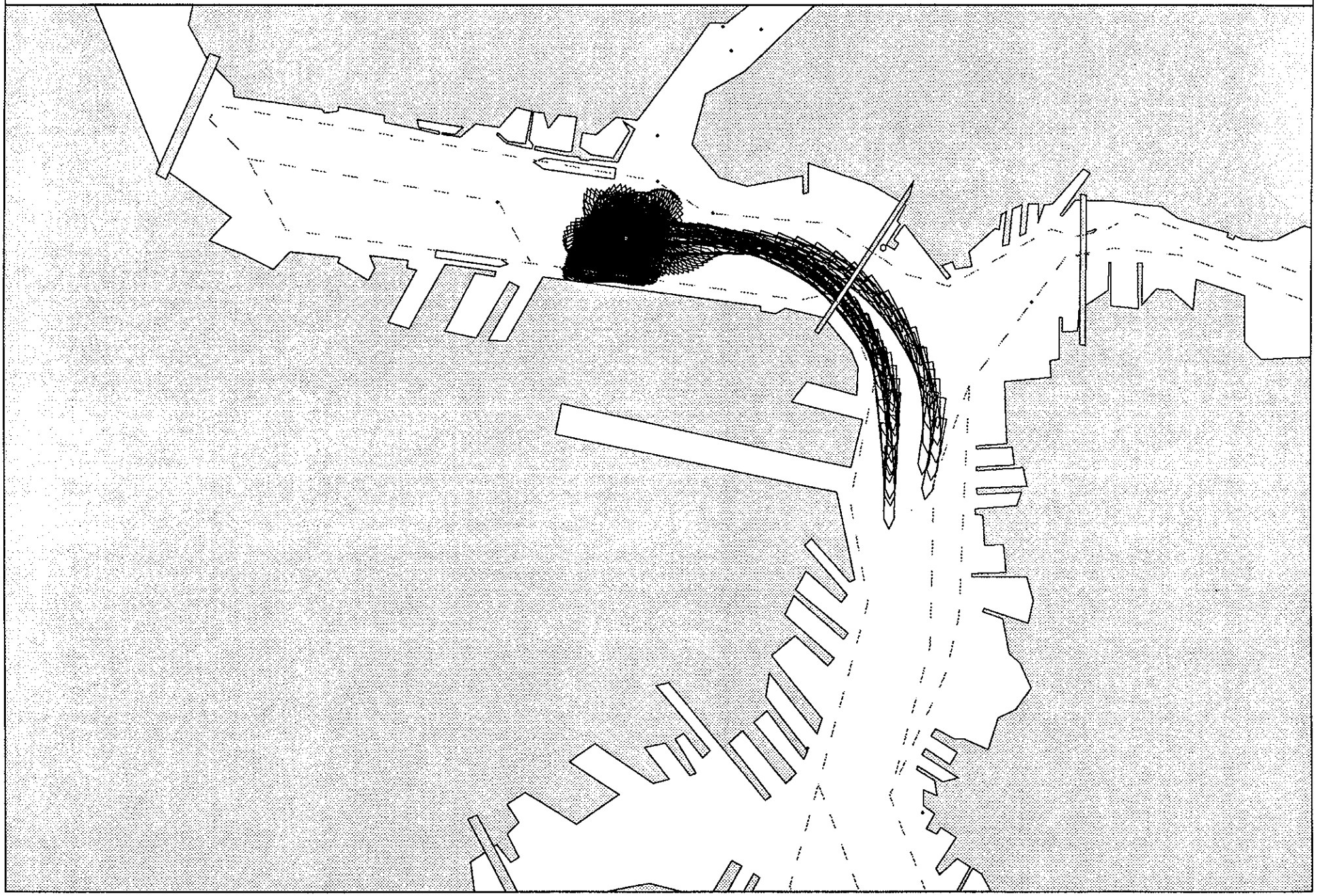

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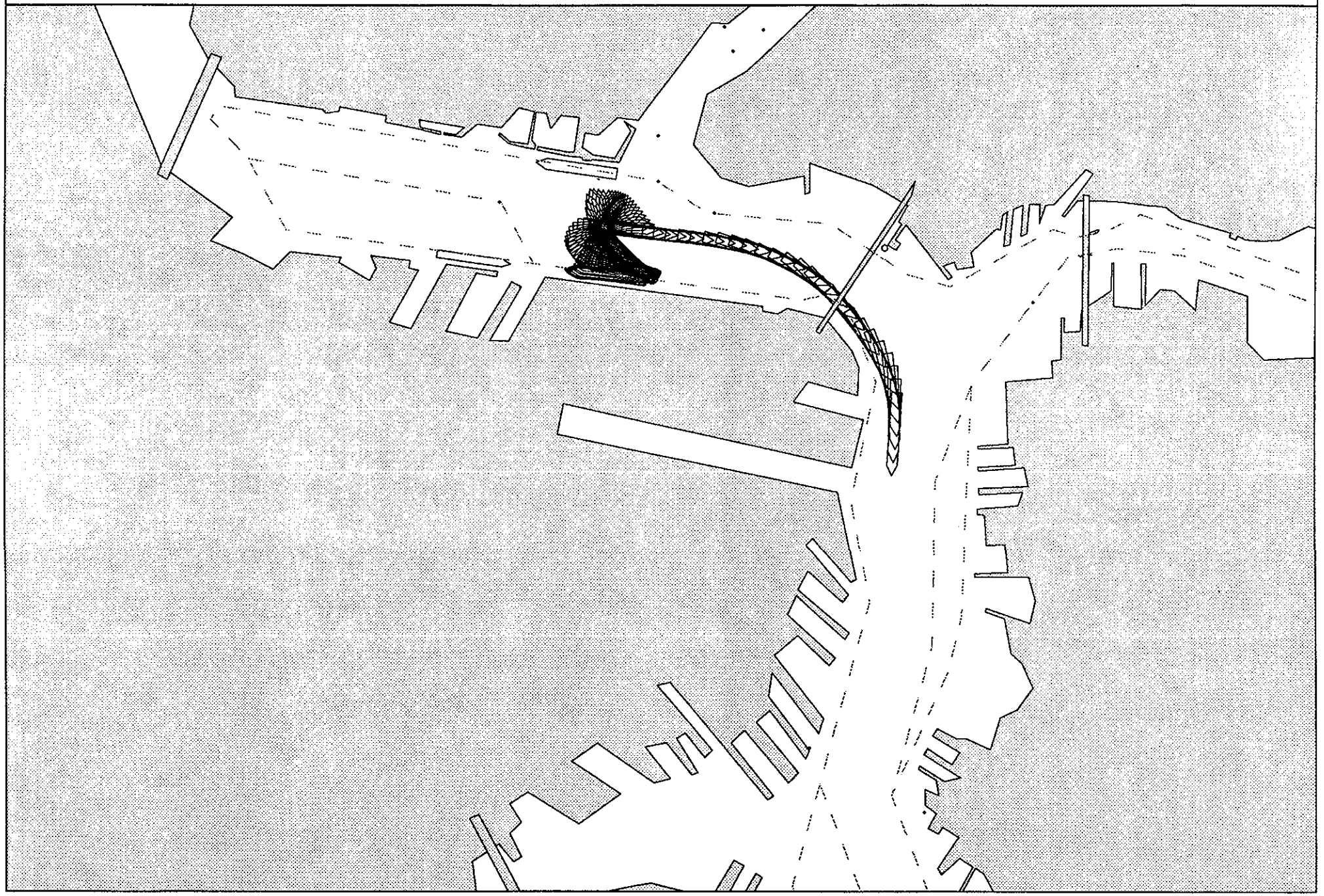

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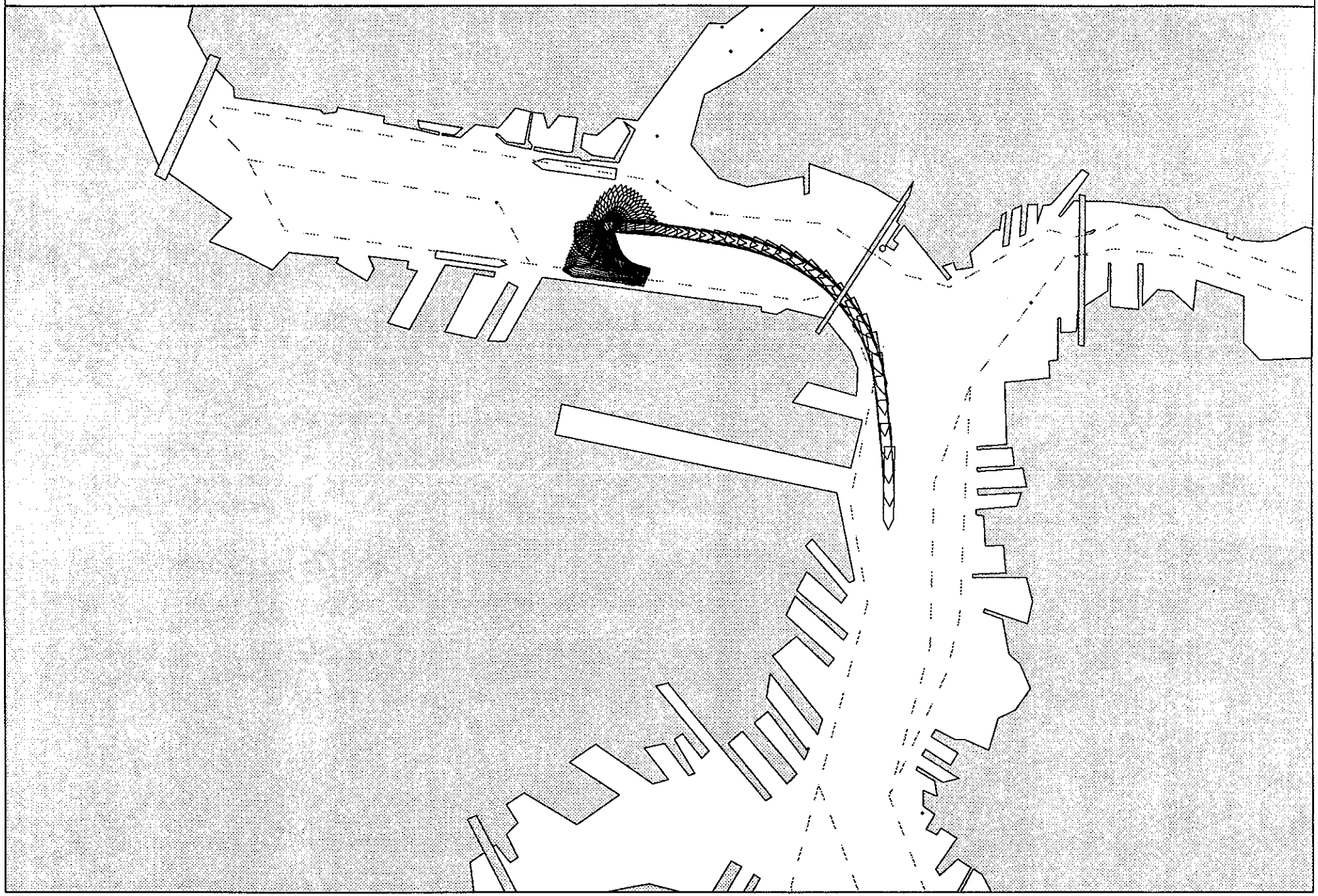

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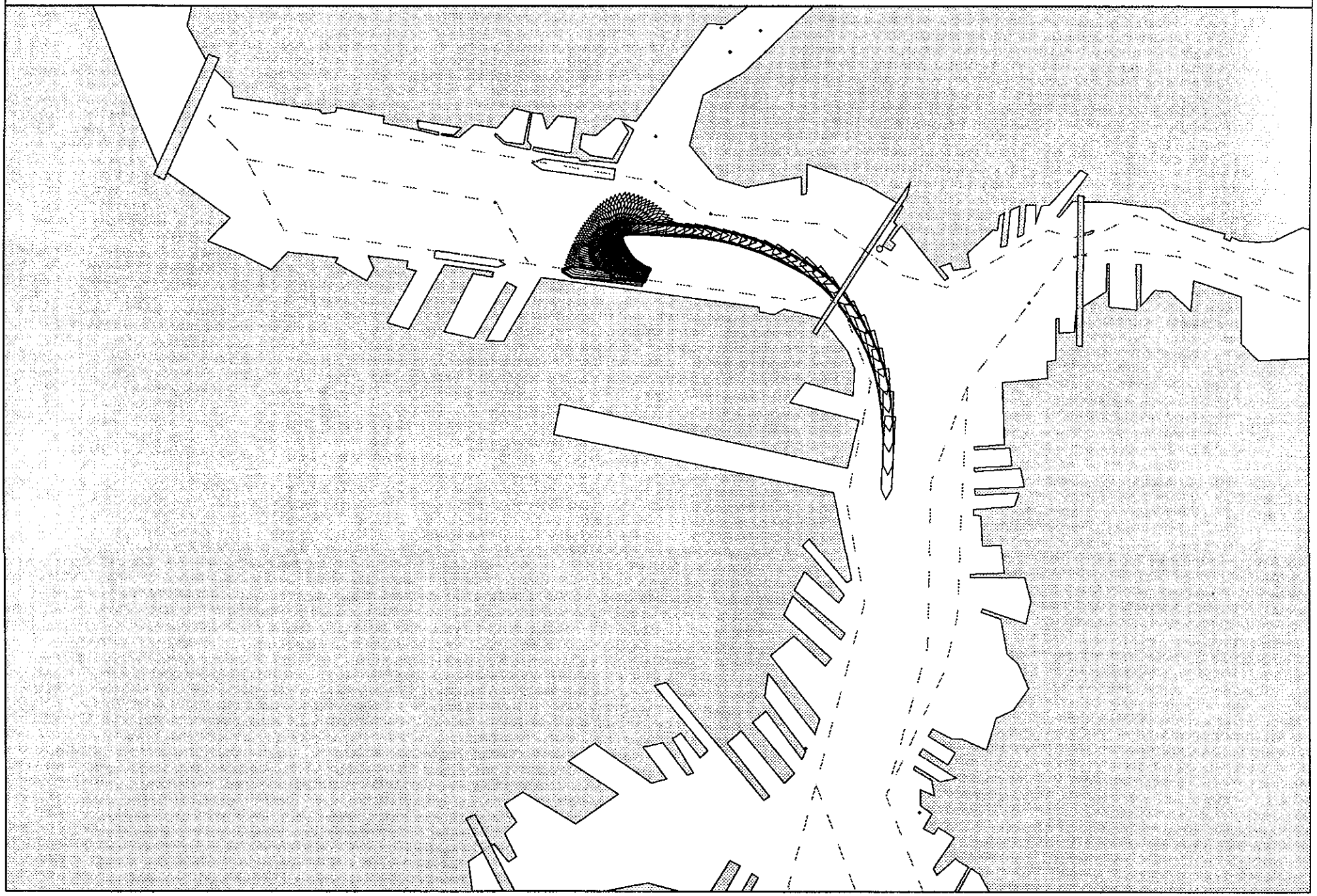

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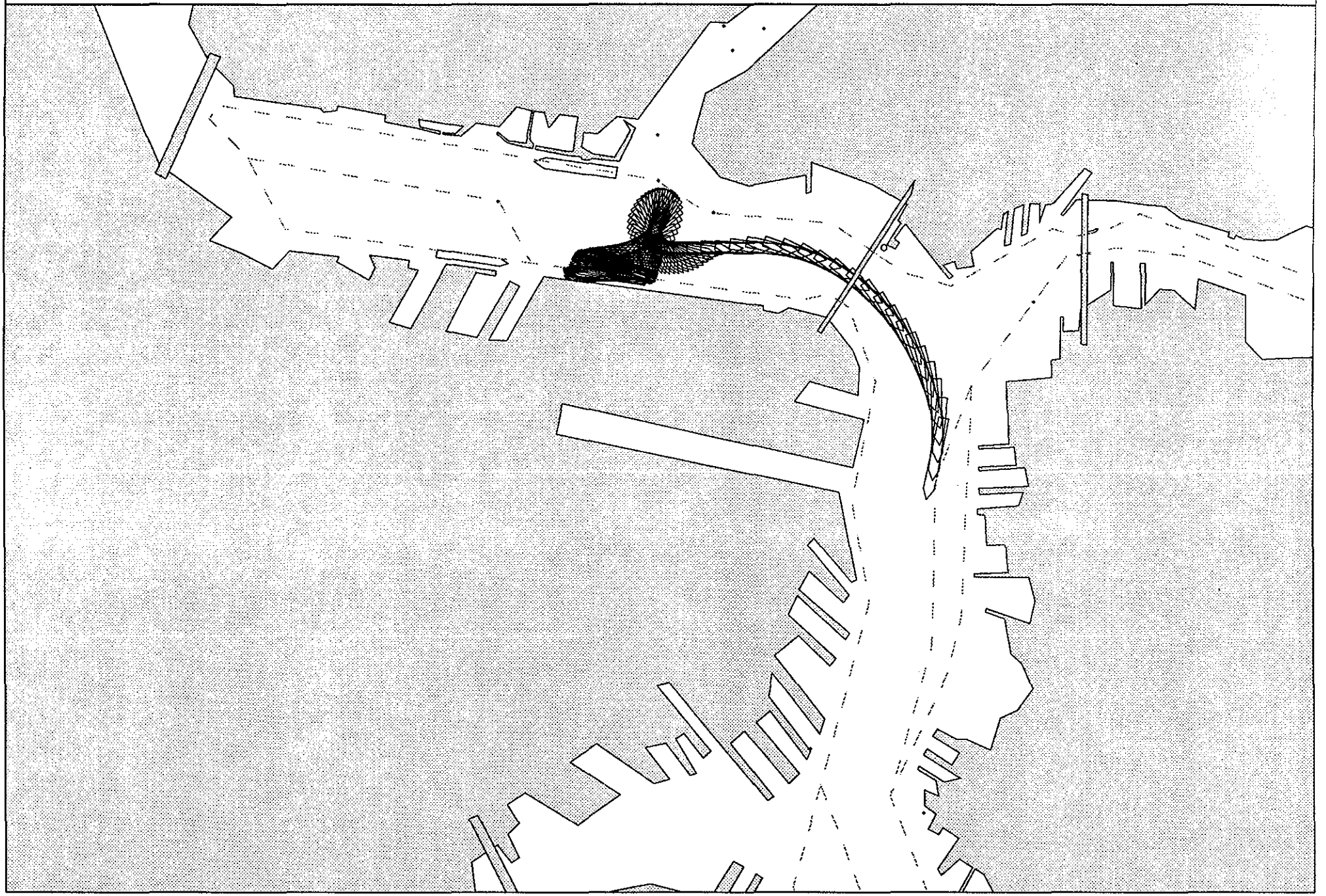

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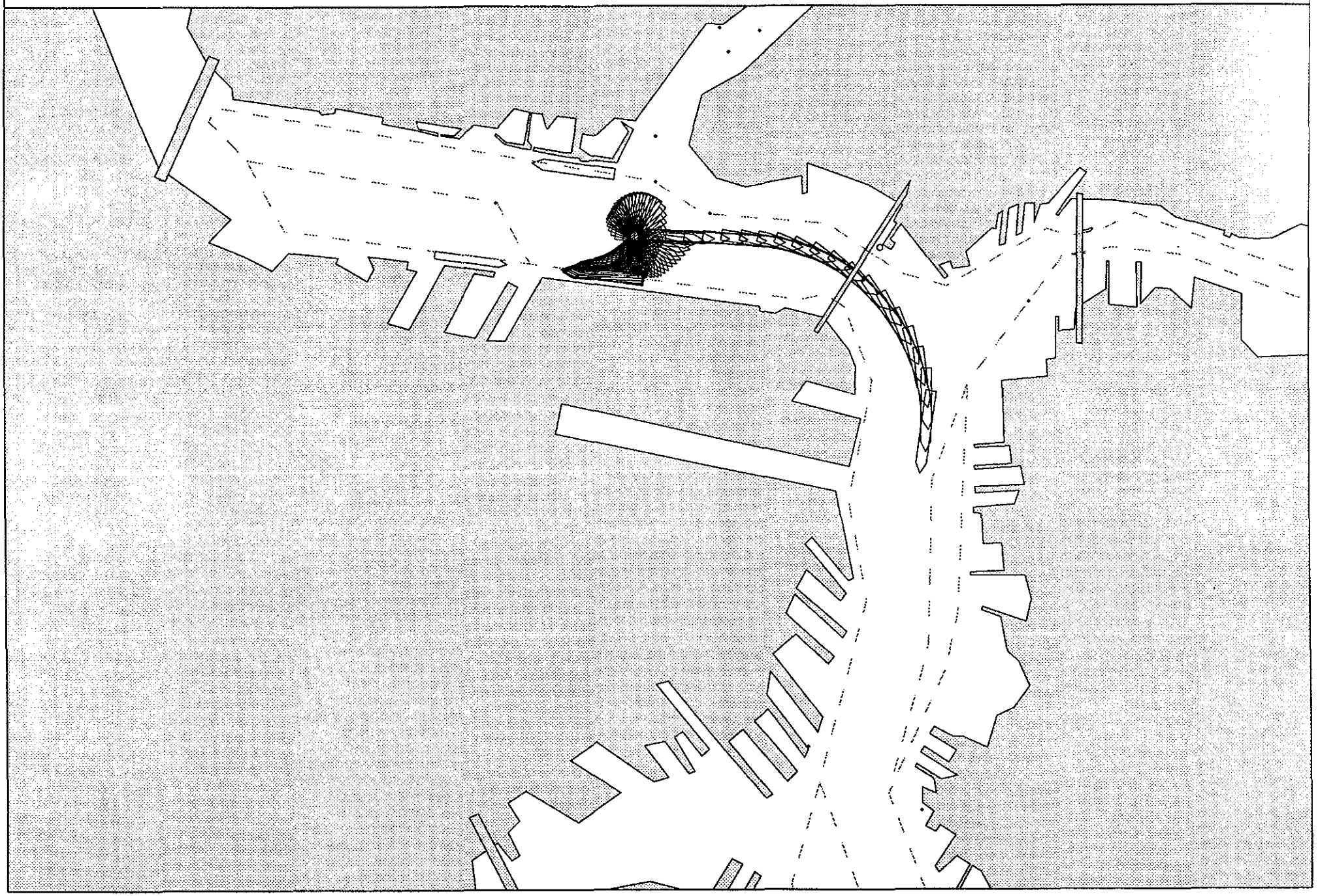

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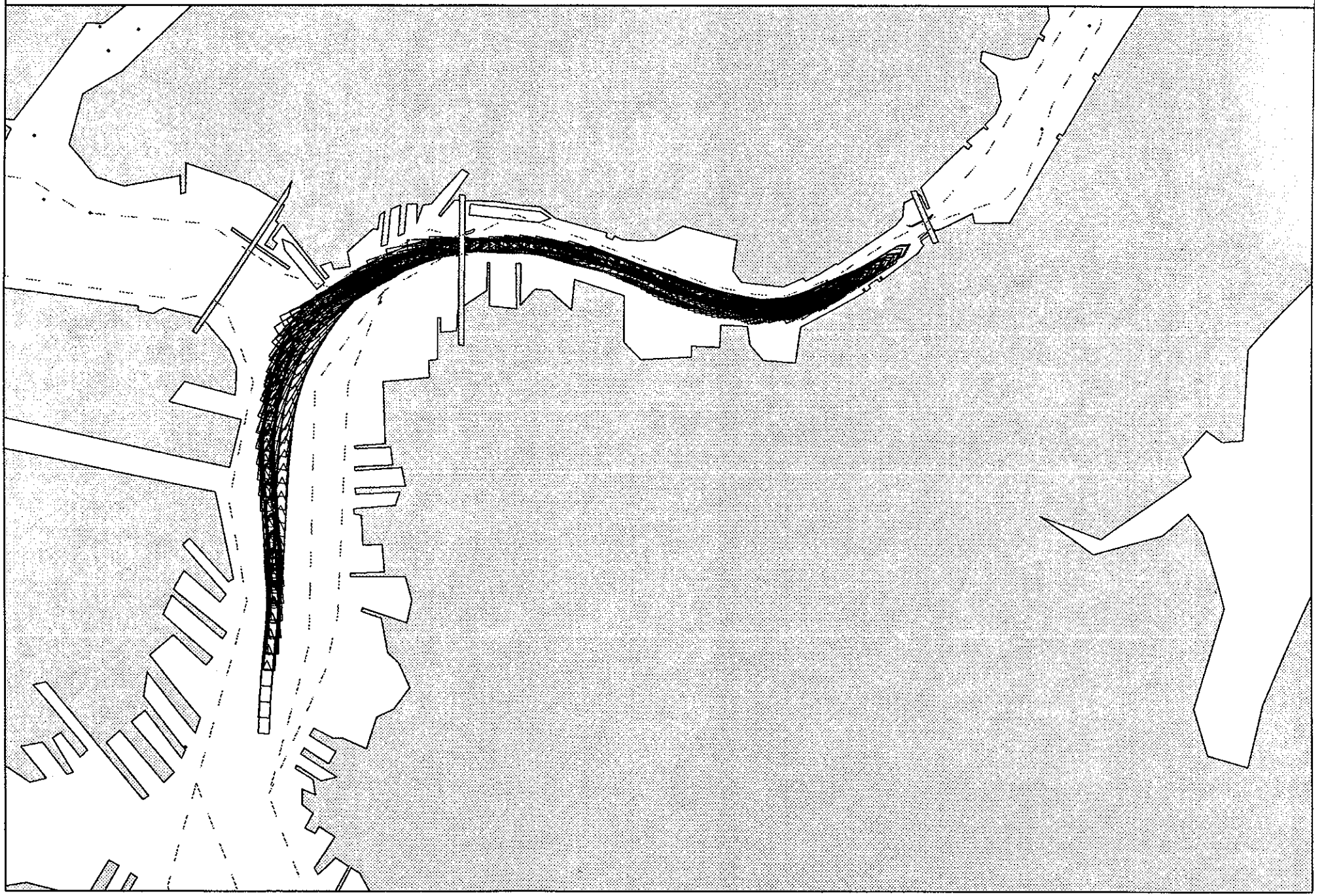

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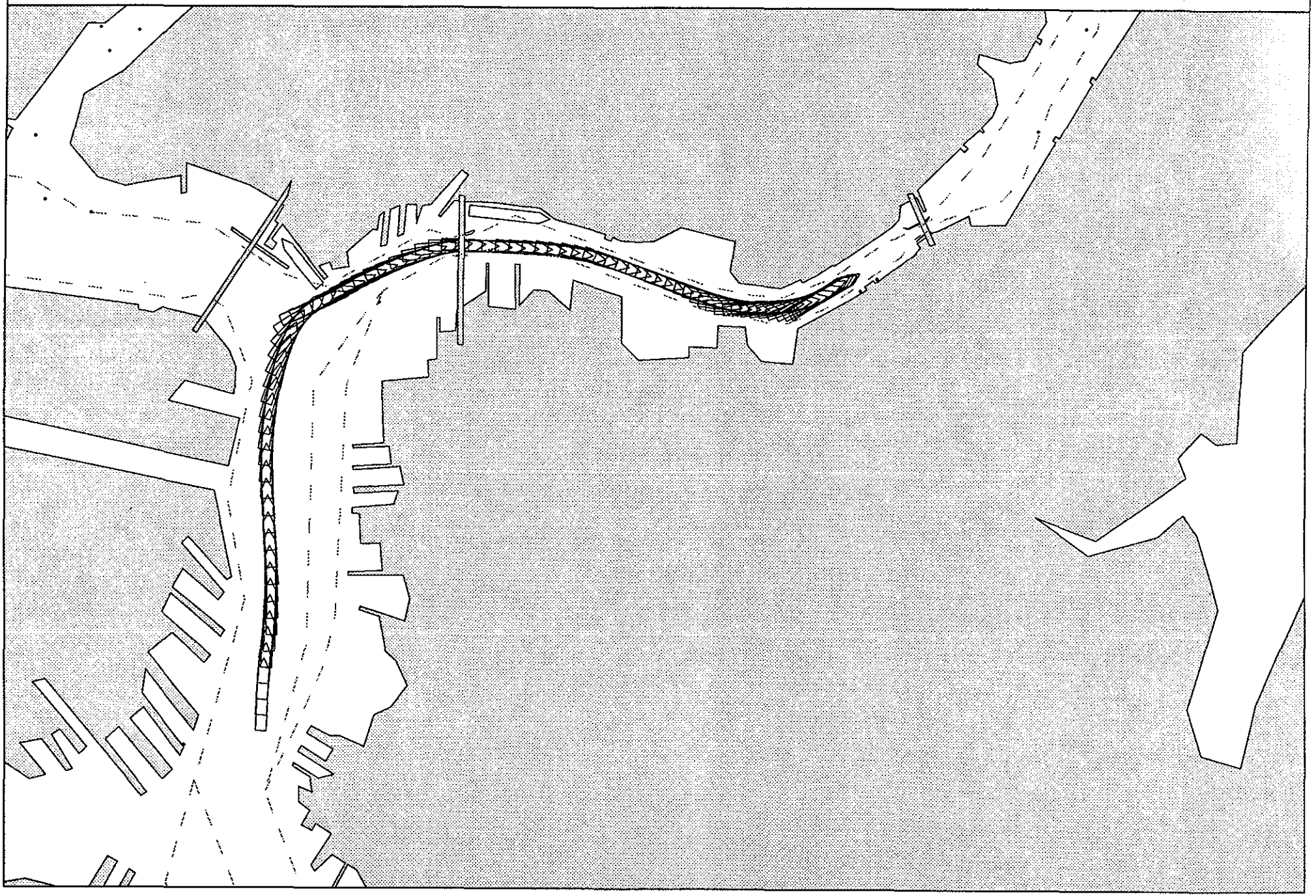

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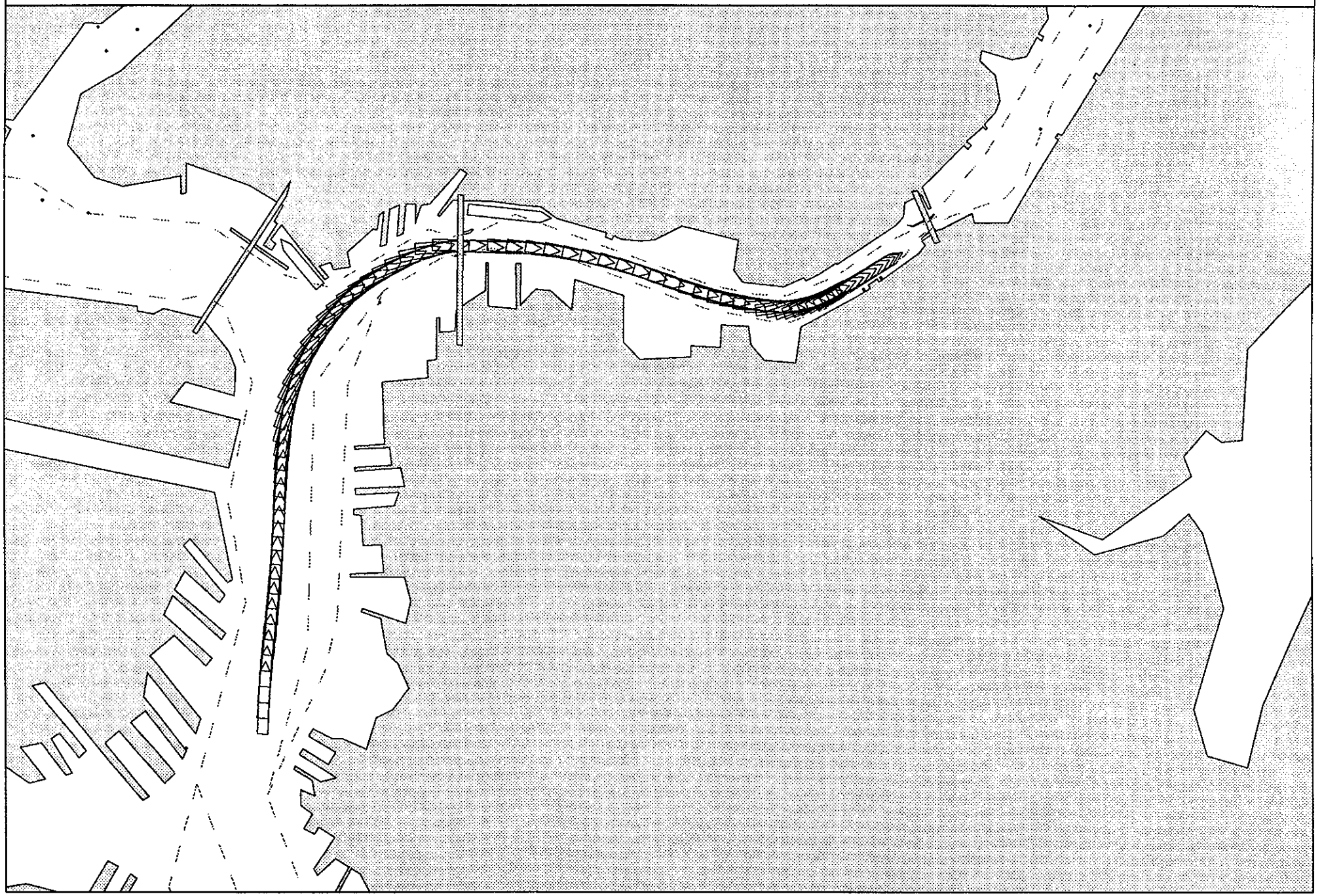

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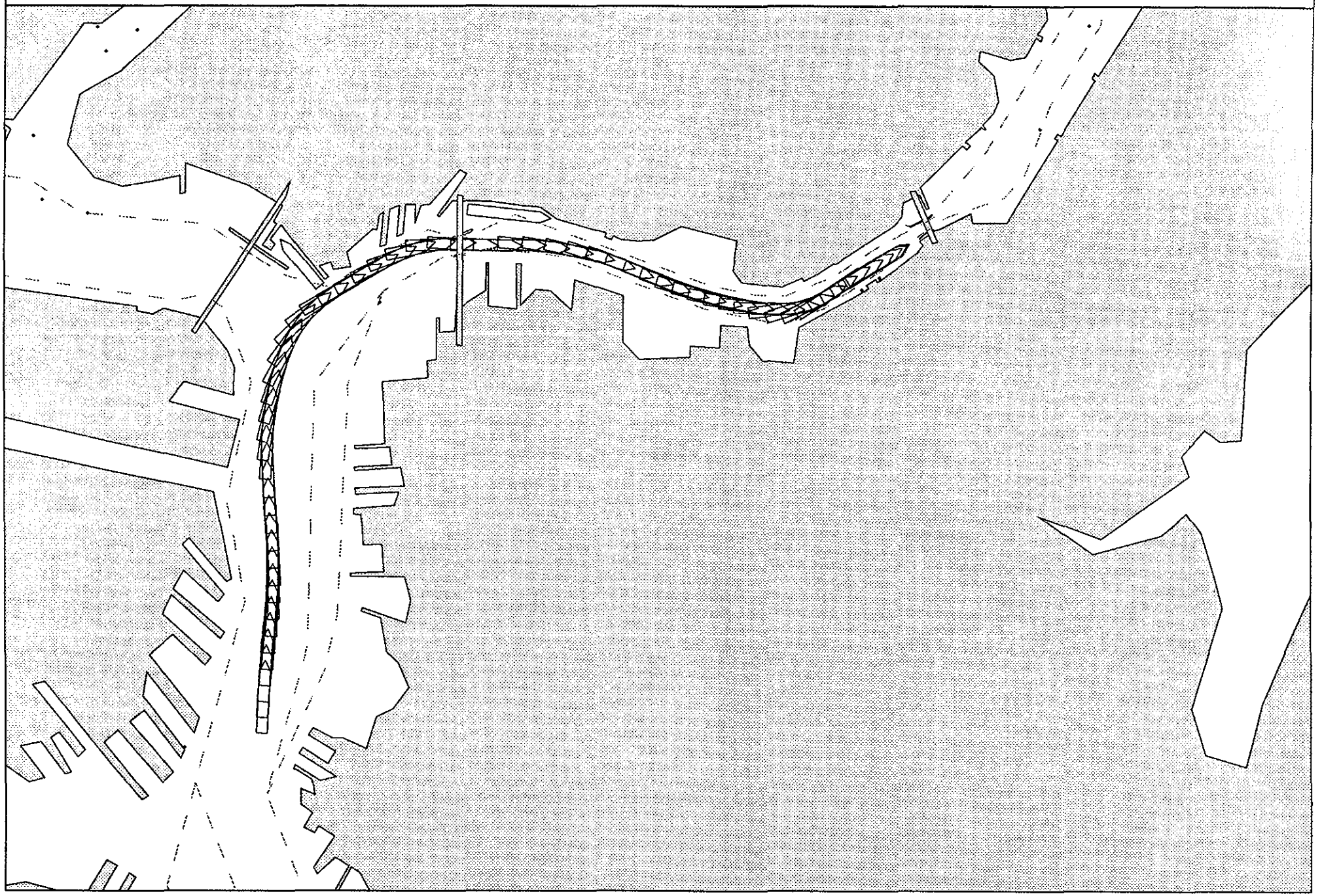

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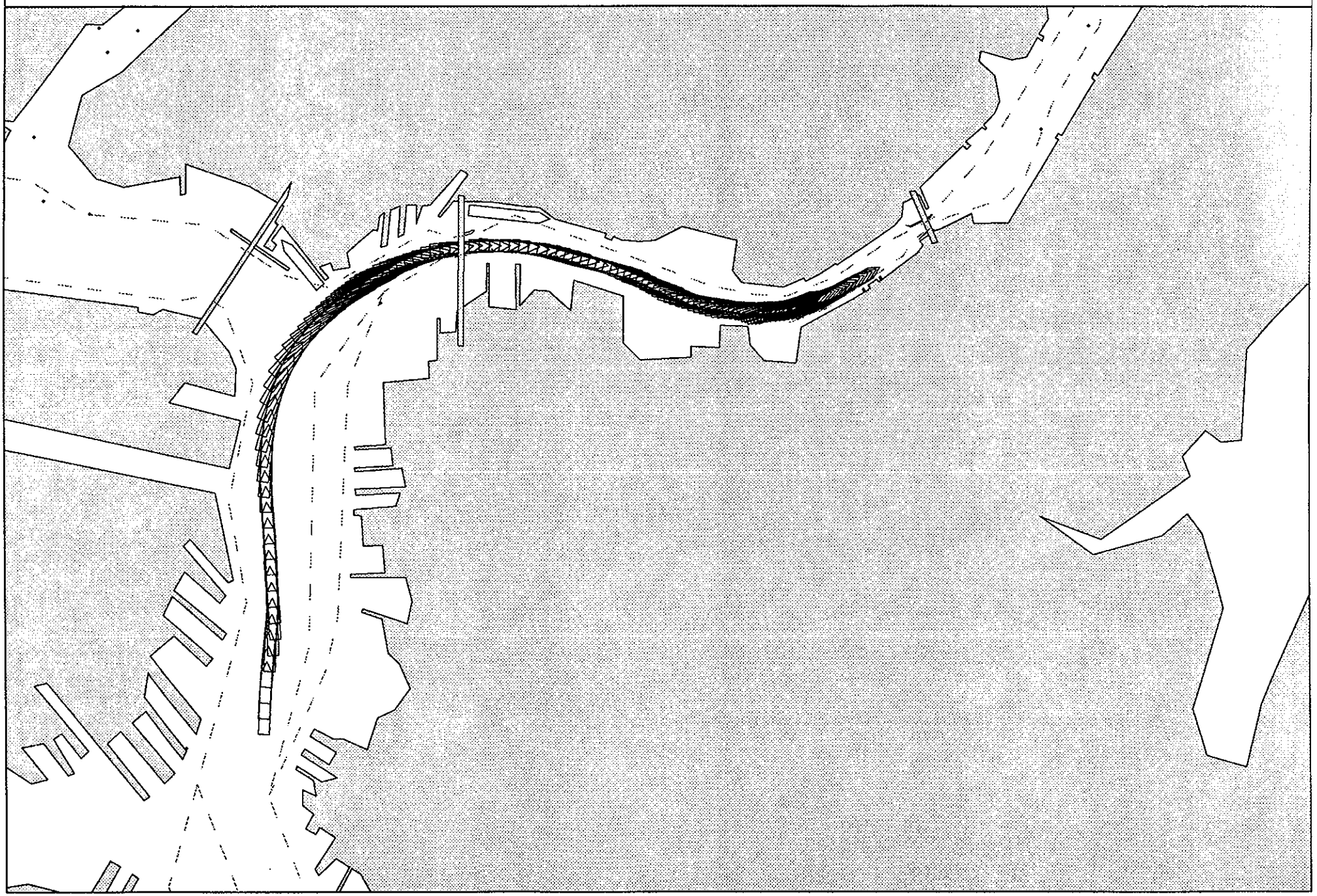

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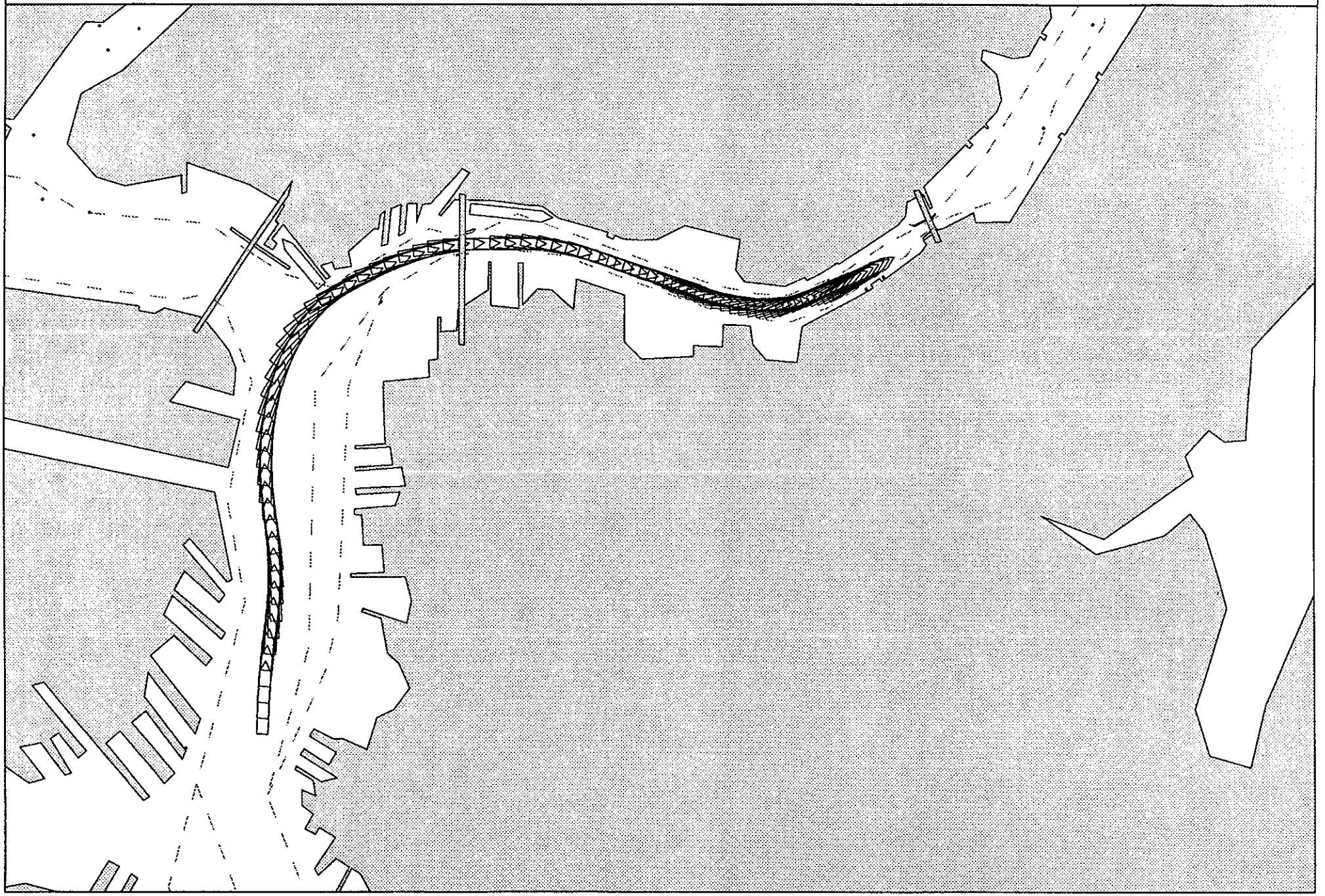

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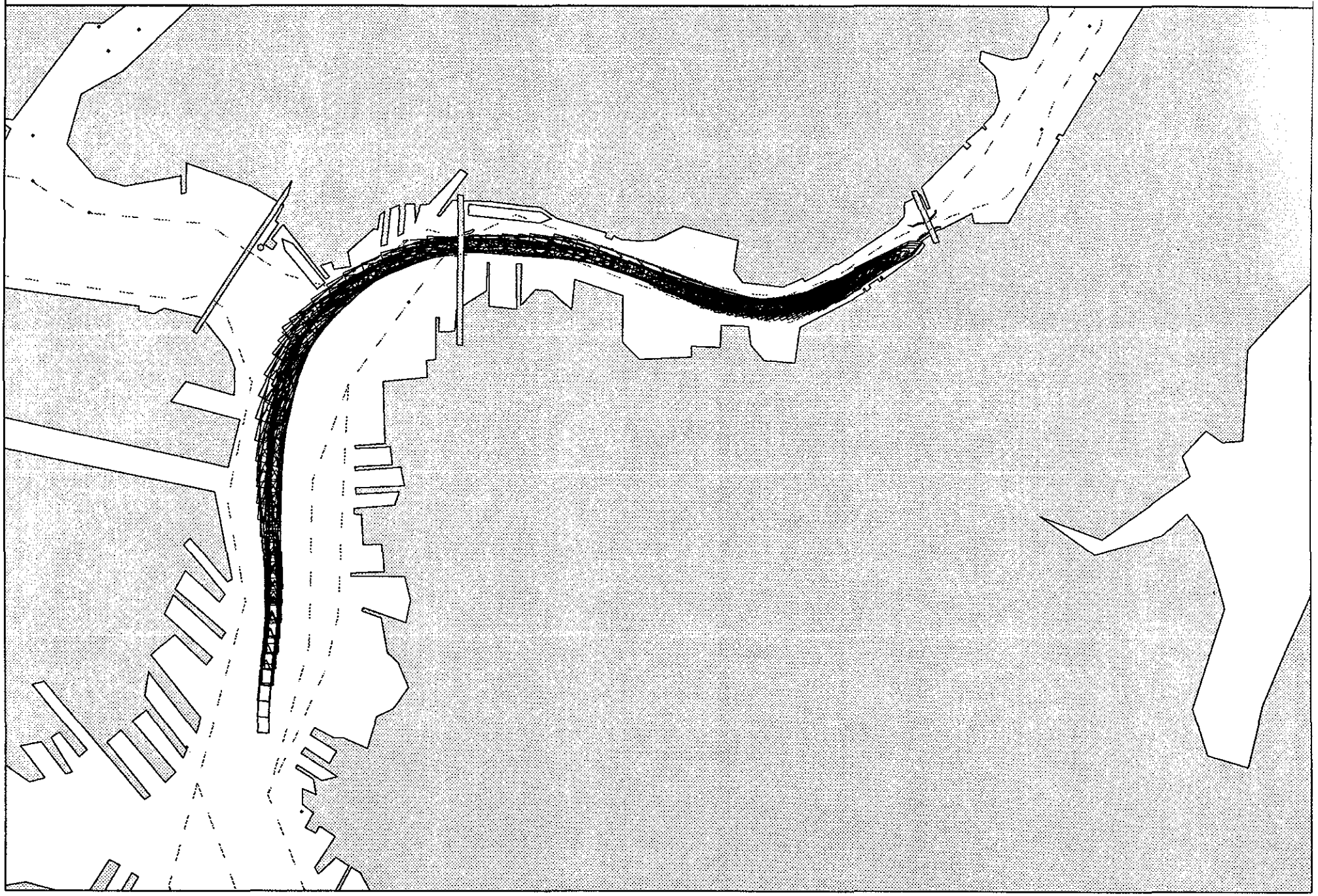

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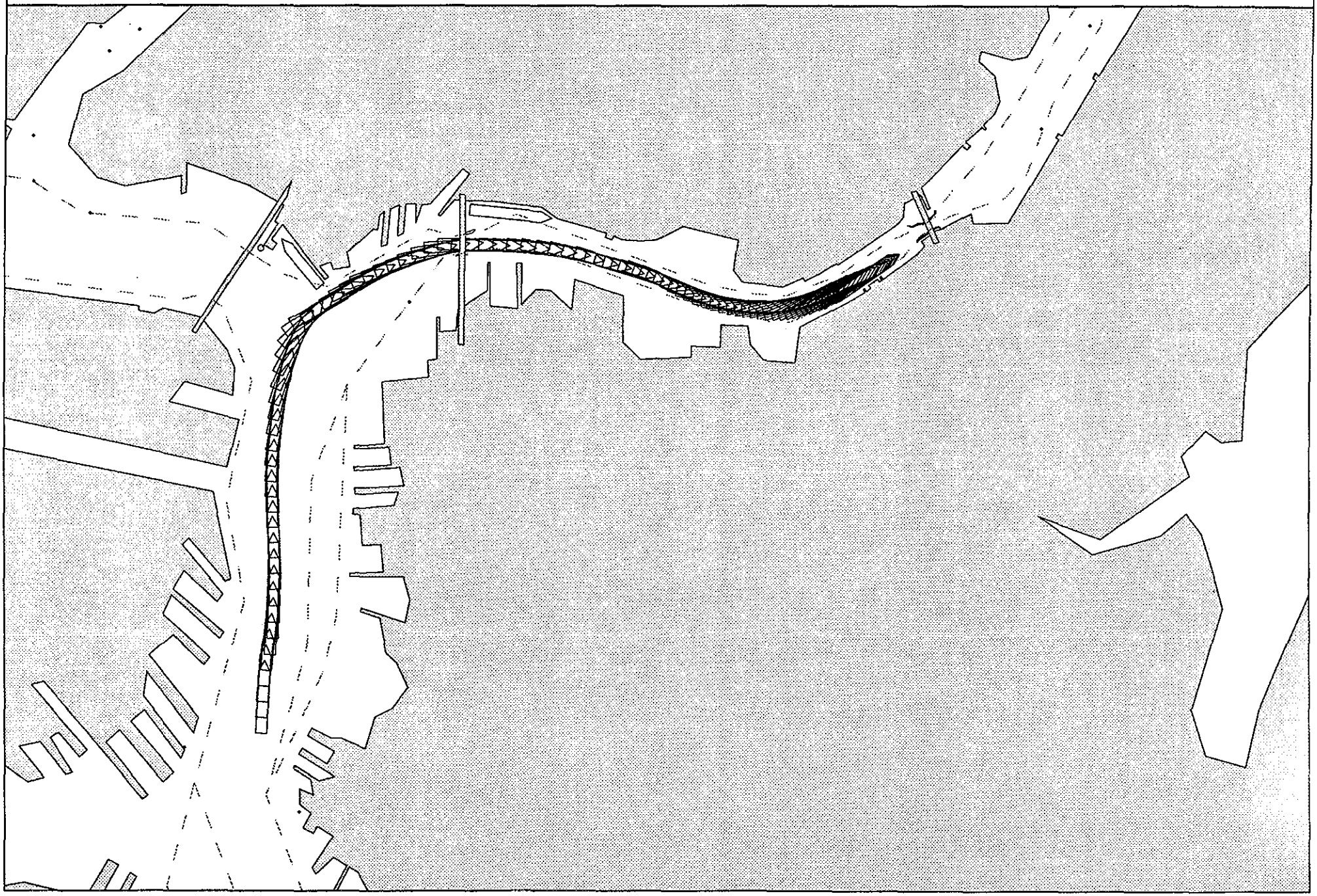

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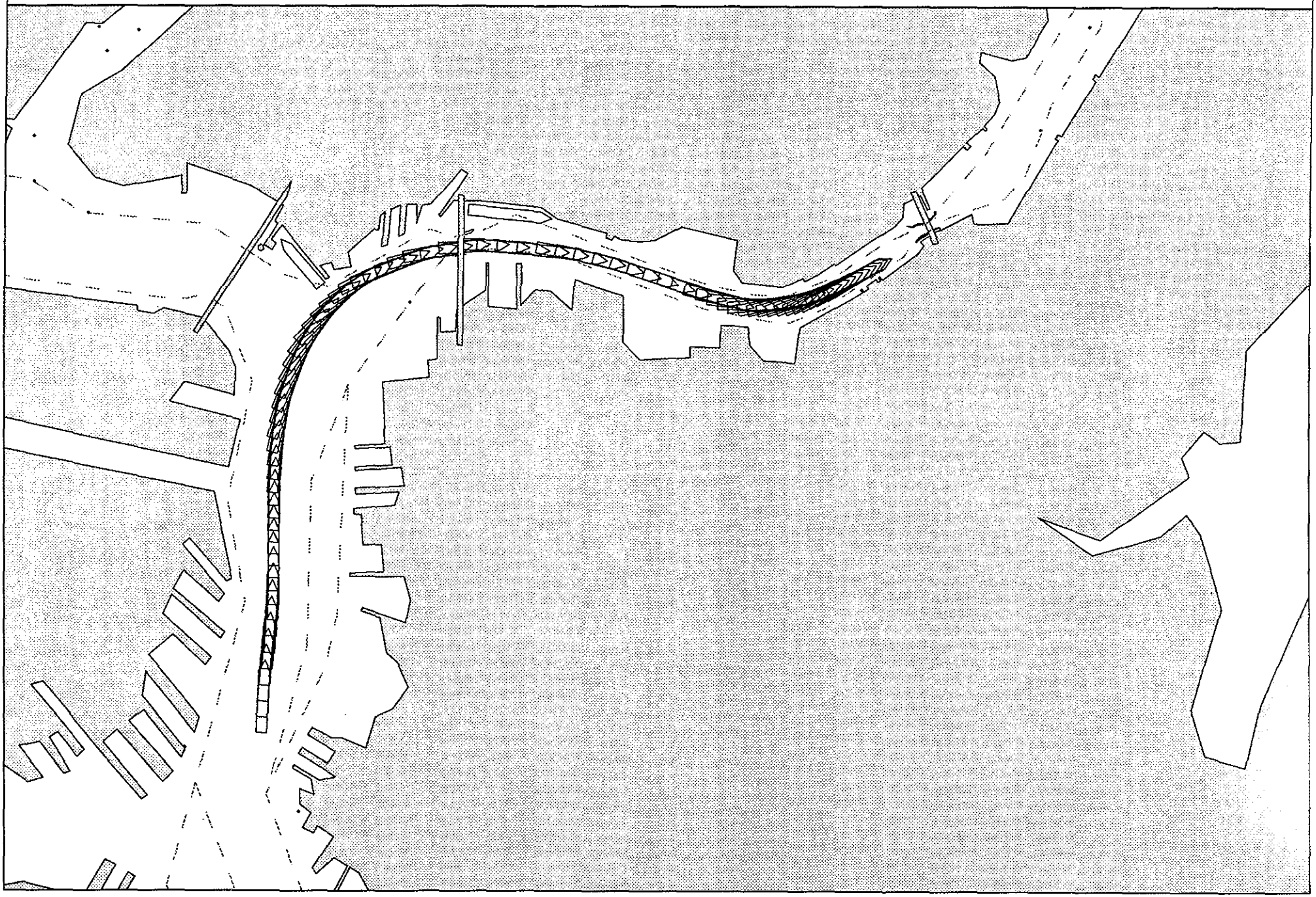

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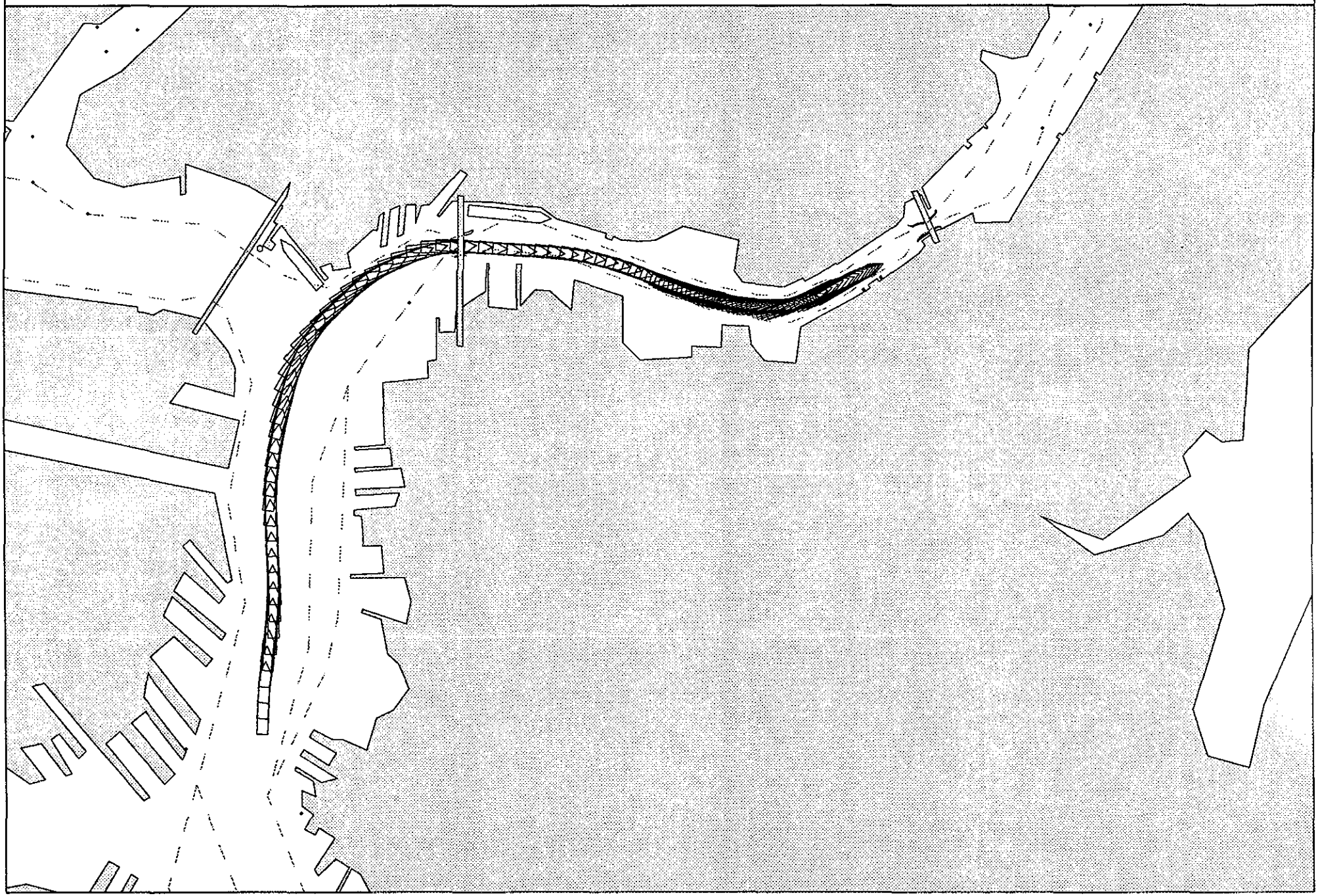
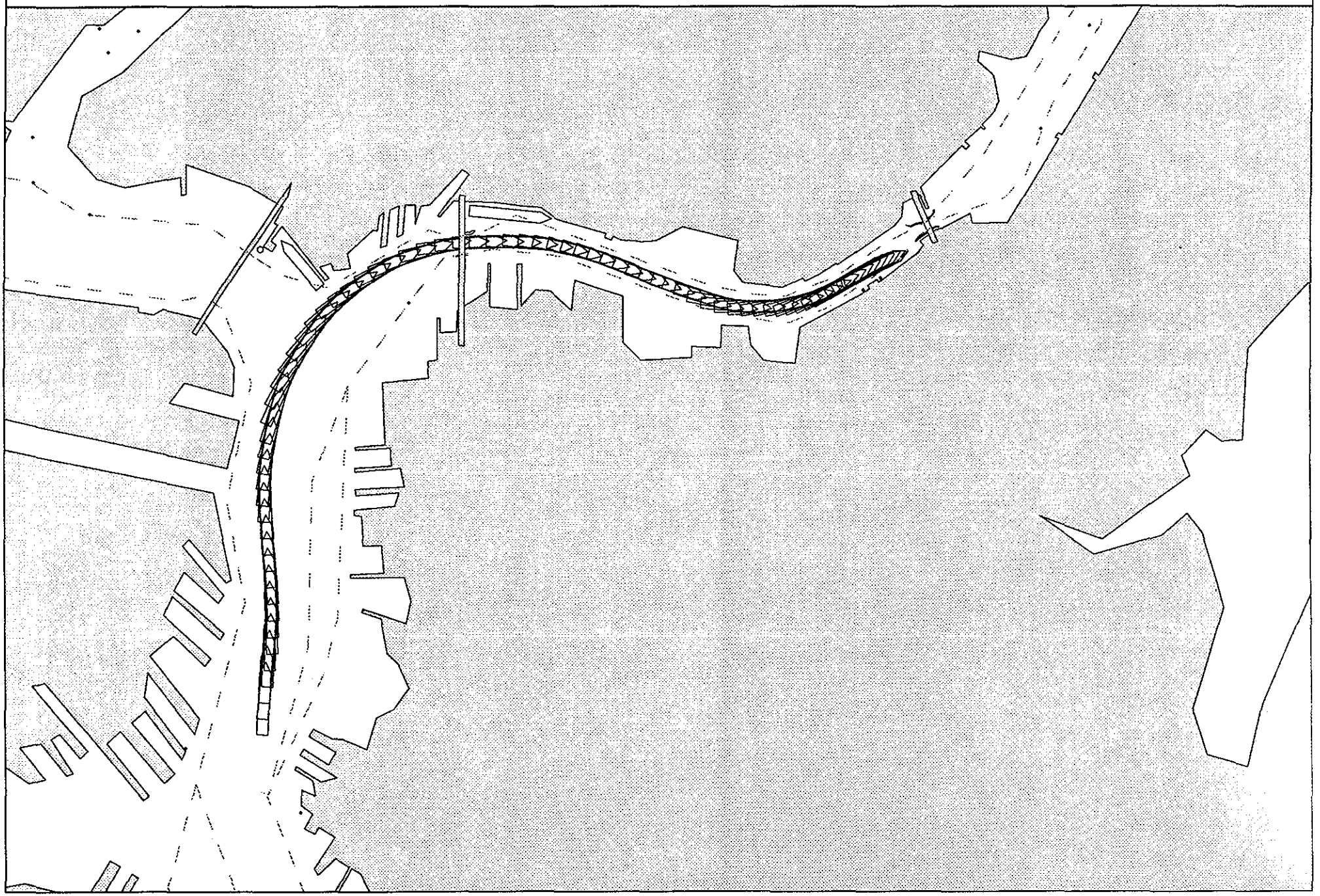


M S I / C A O R F

FILE ID :54184000 DATABASE : BOSTONP1.DB TRACK LINE :



M S I / C A O R F

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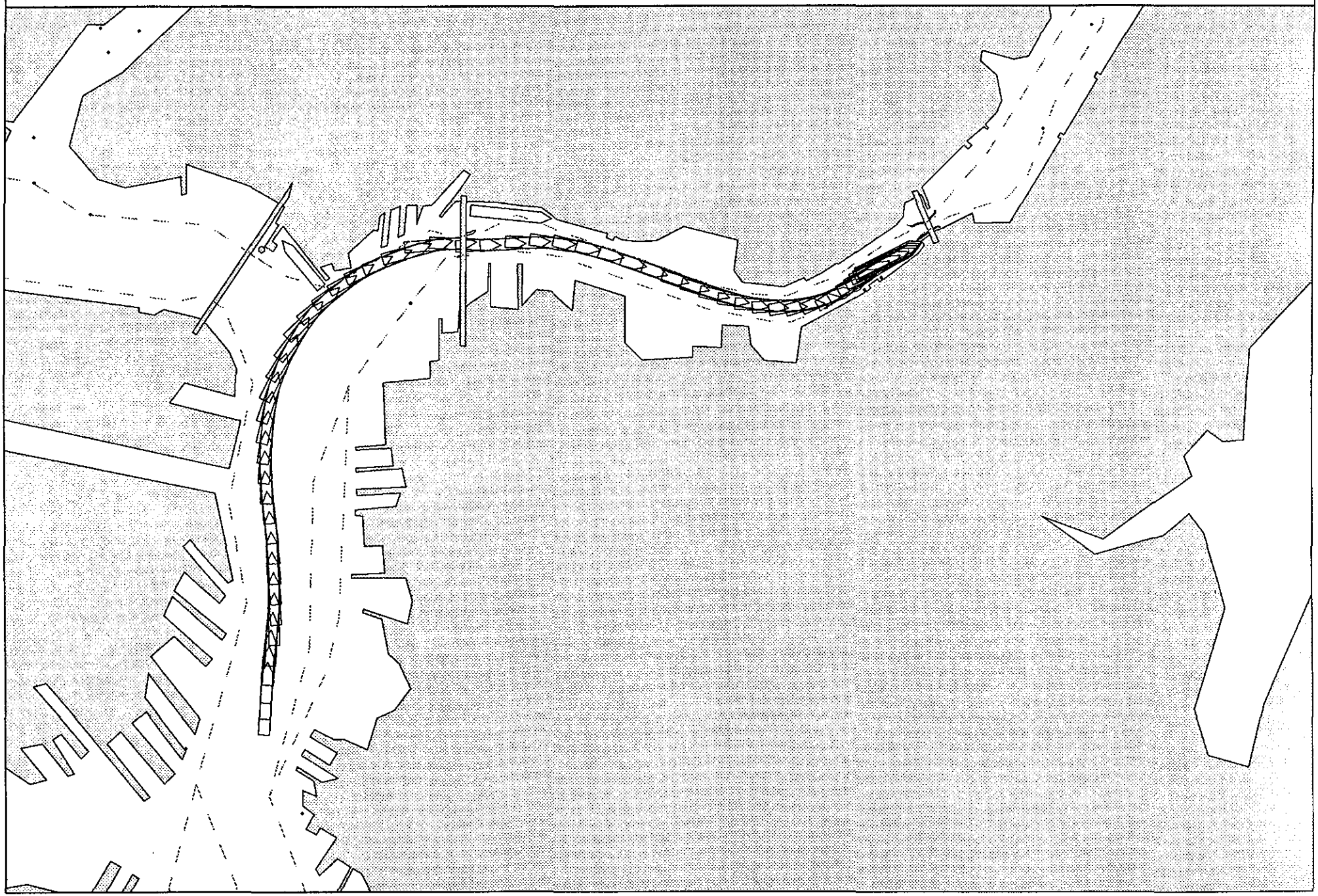
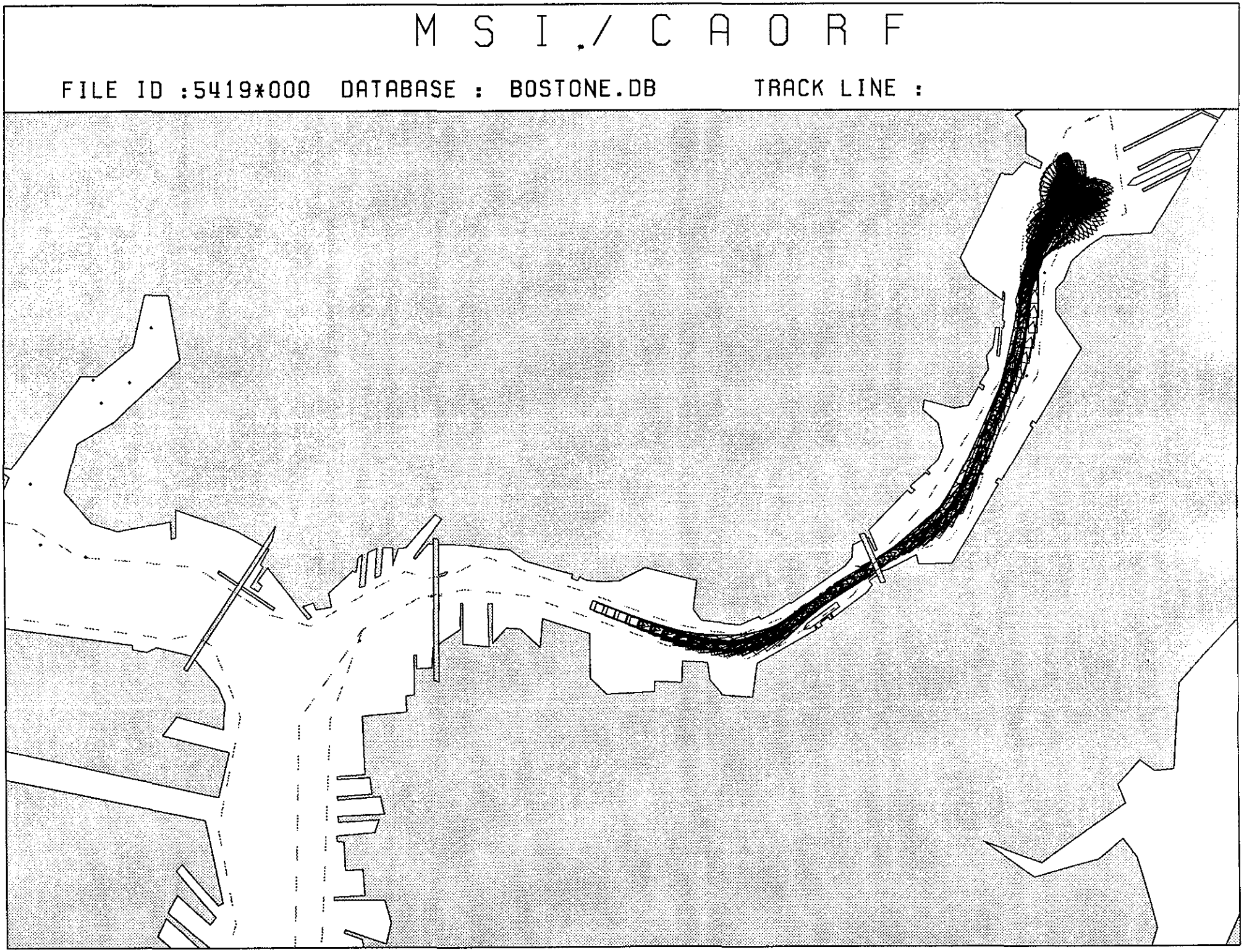
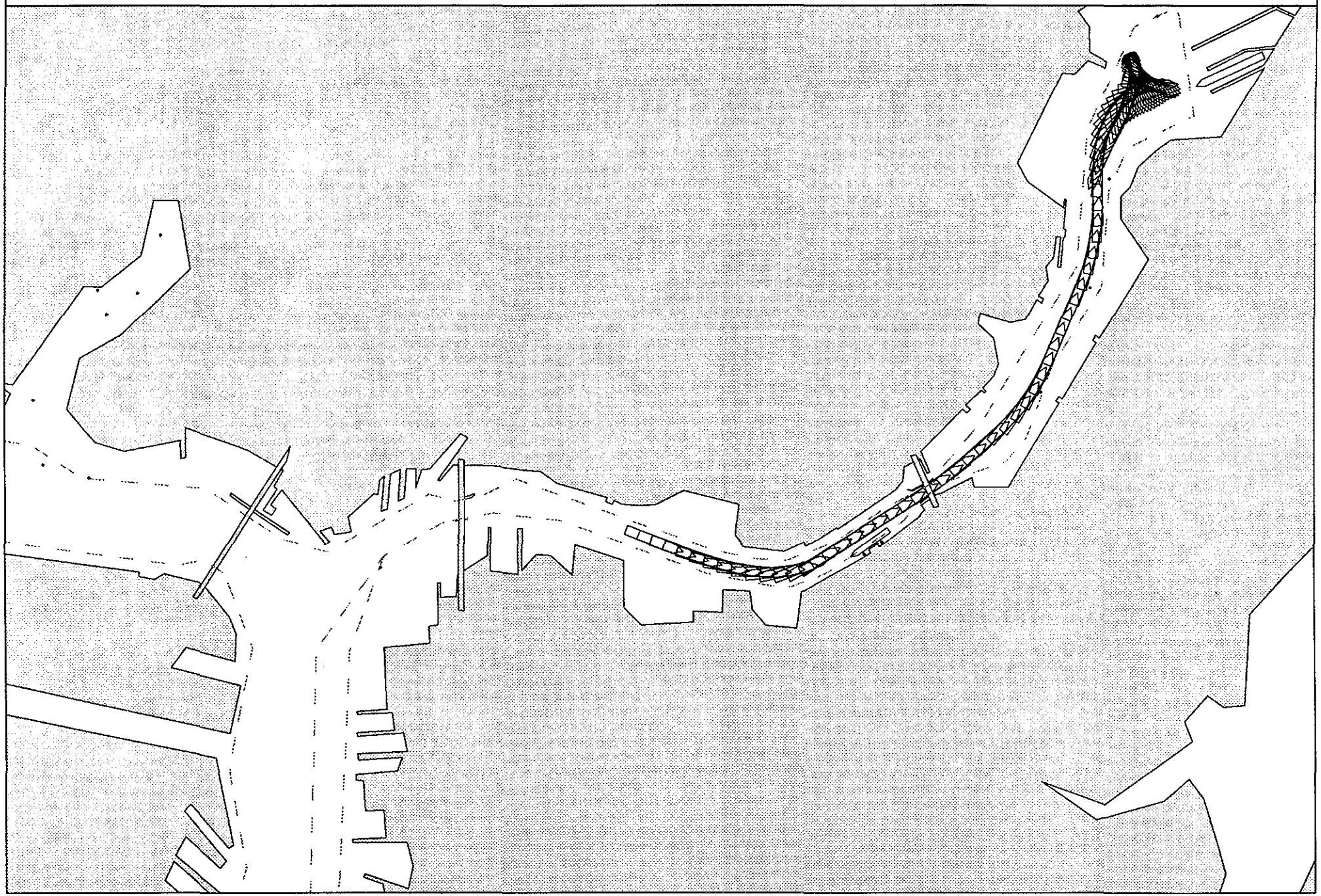



M S I / C A O R F
FILE ID :5419*000 DATABASE : BOSTONE.DB TRACK LINE :

M S I / C A O R F

FILE ID :54191000 DATABASE : BOSTONE.DB TRACK LINE :



M S I / C A O R F

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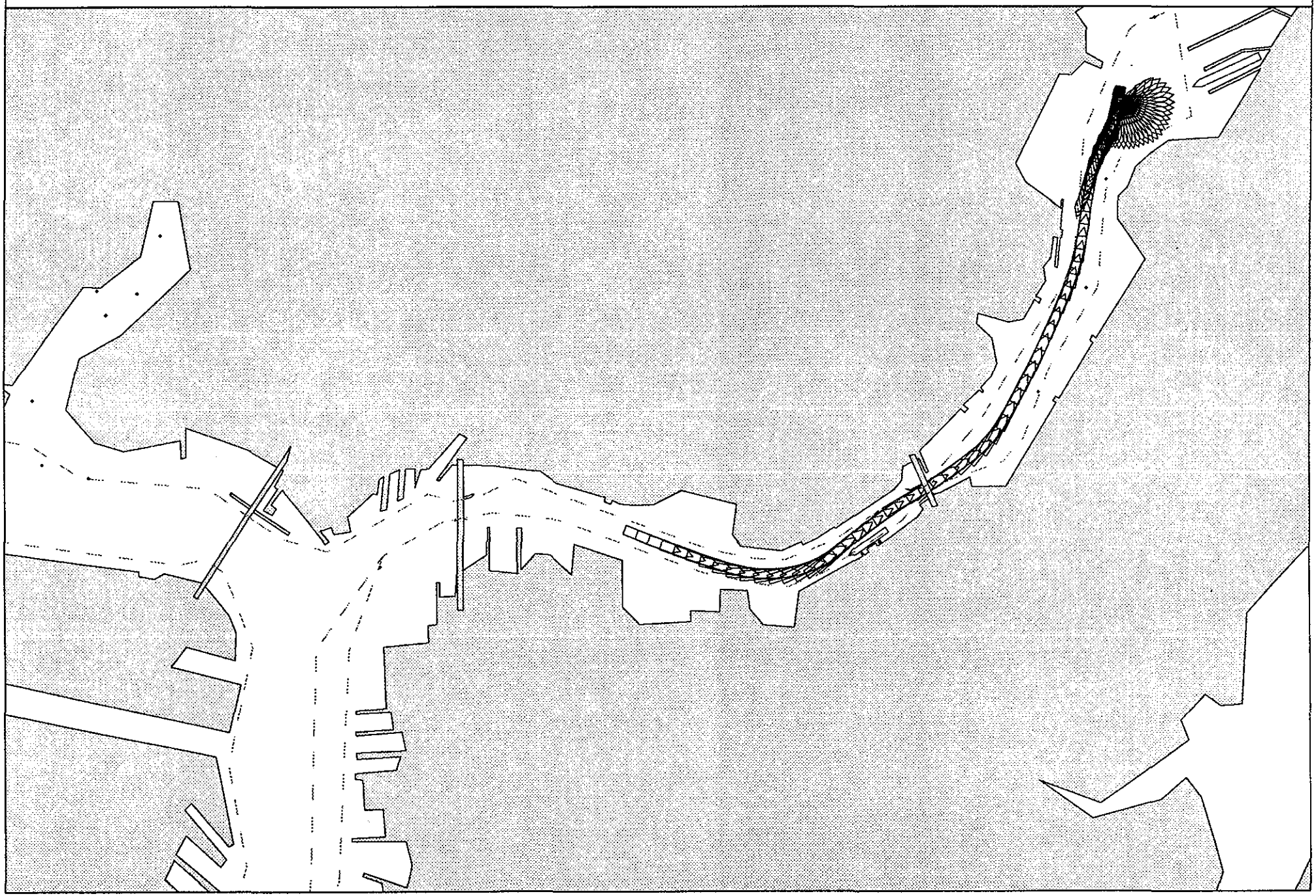
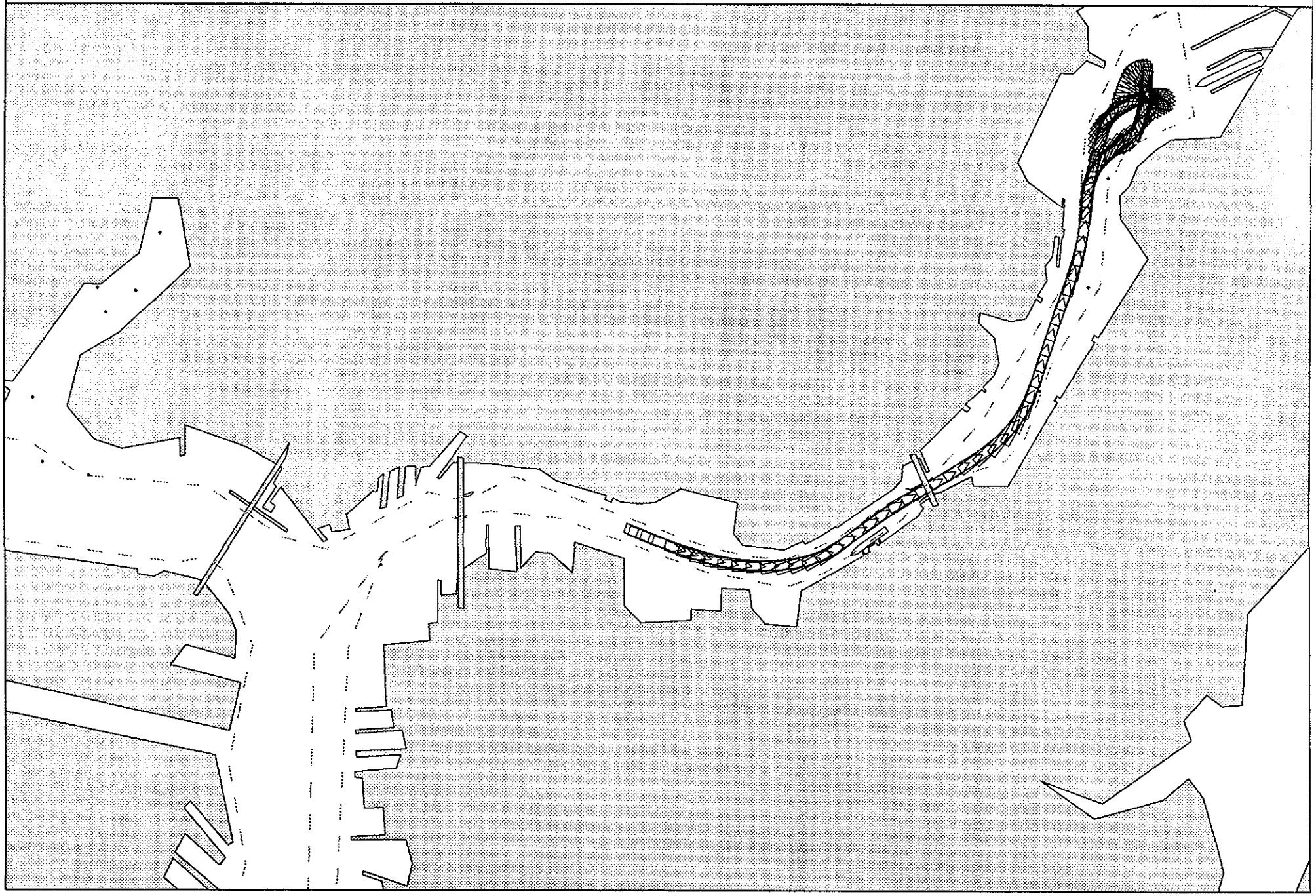


M S I / C A O R F

FILE ID :54193000 DATABASE : BOSTONE.DB TRACK LINE :



M S I / C A O R F

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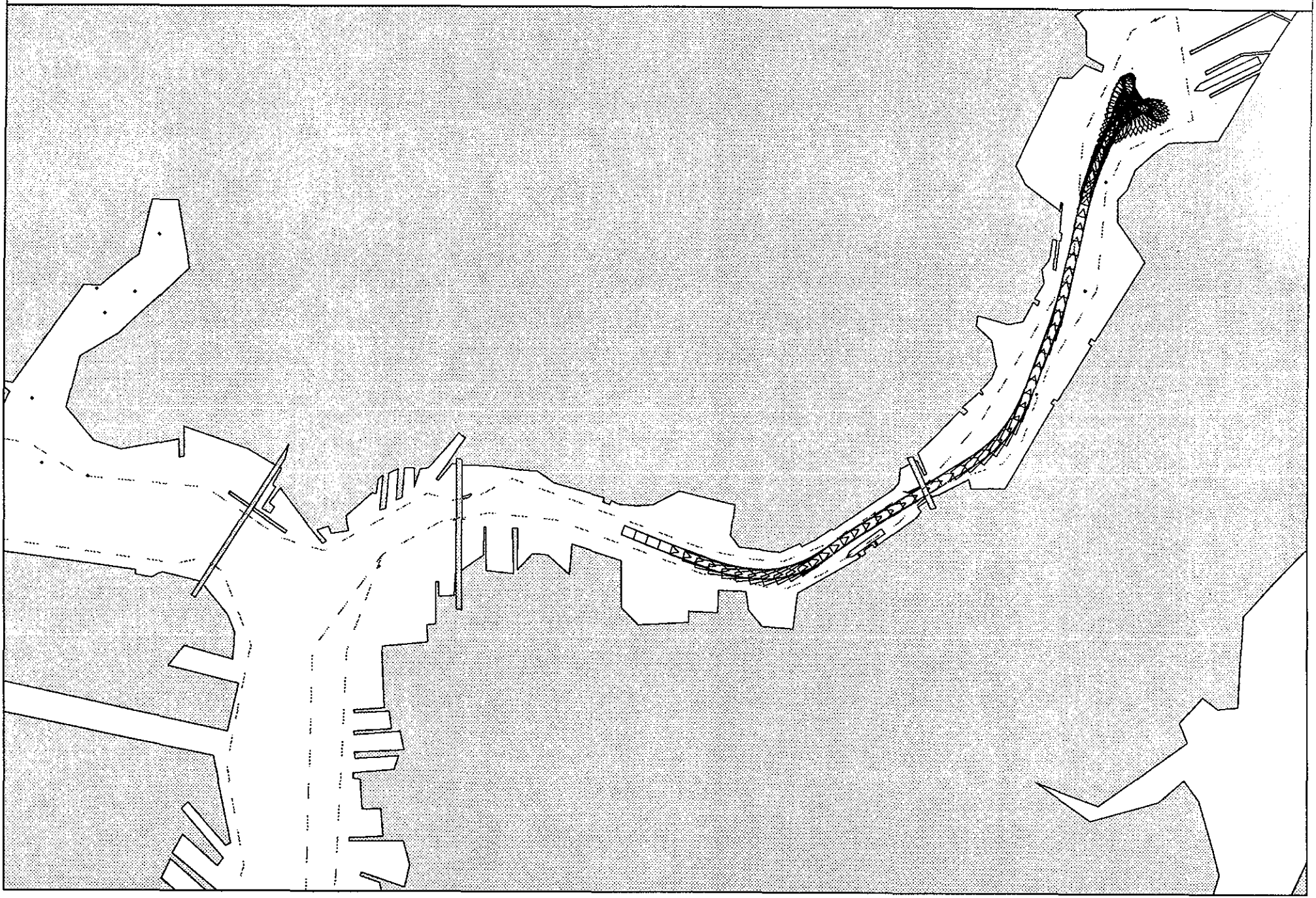

M S I / C A O R F

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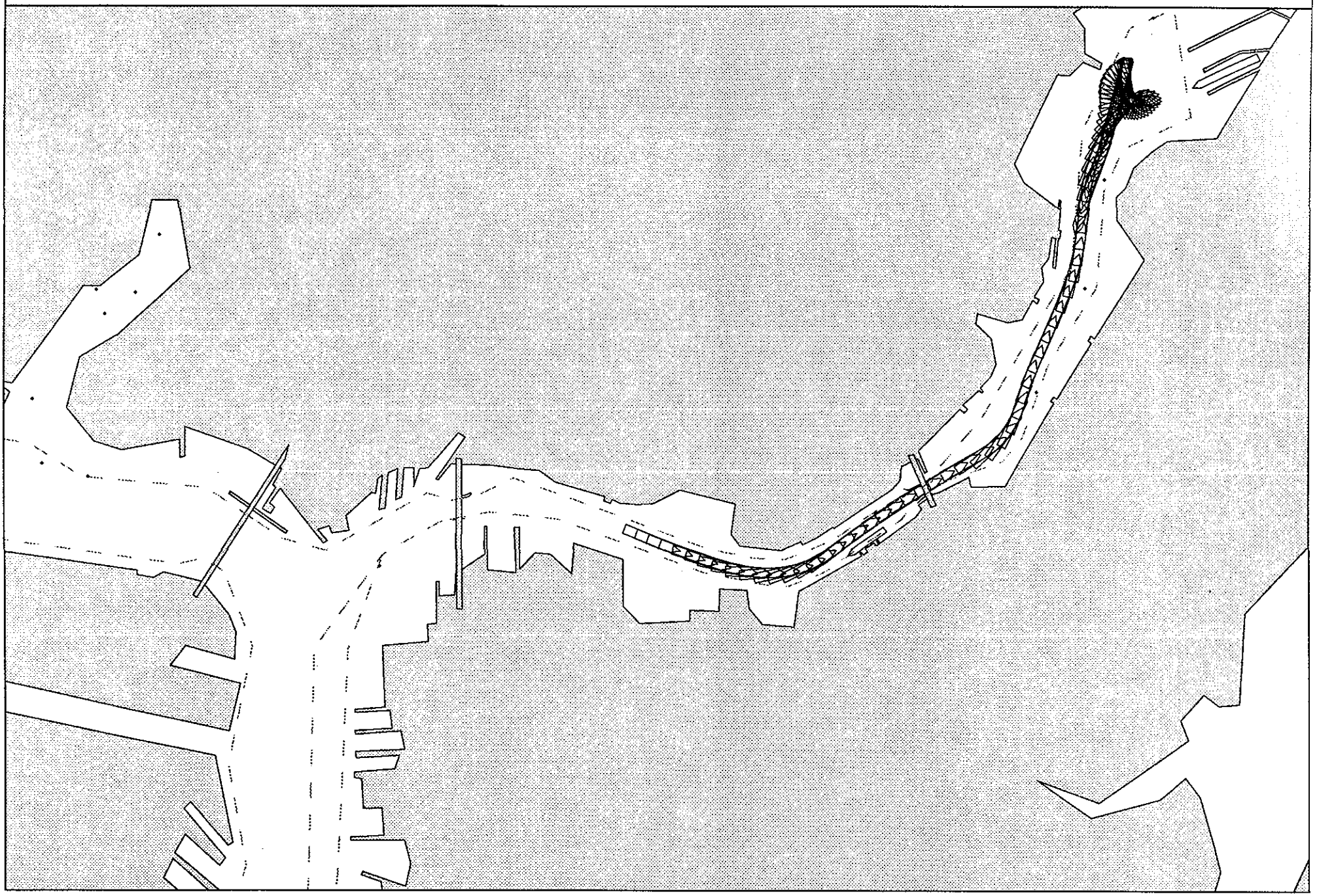

M S I / C A O R F

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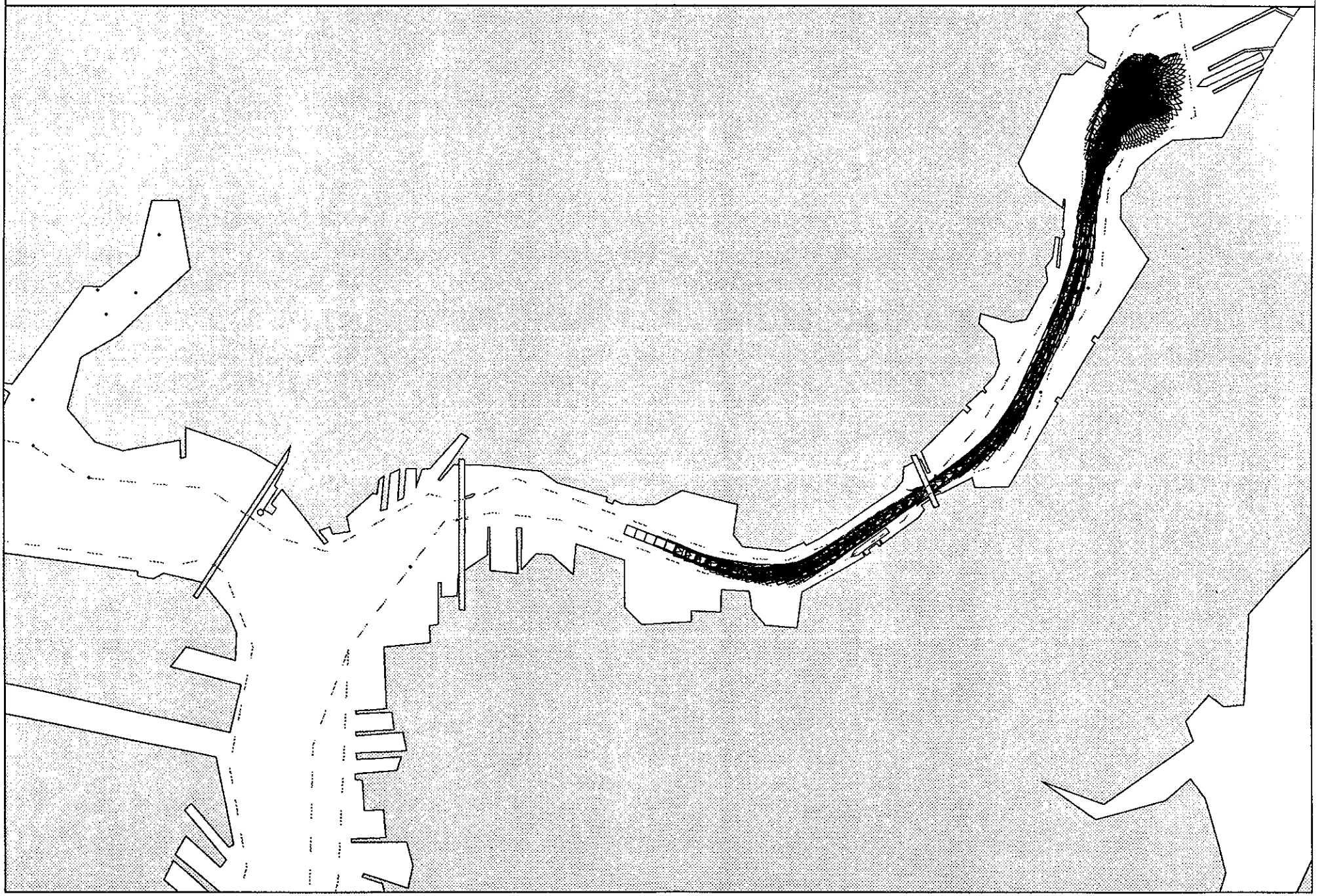

M S I / C A O R F

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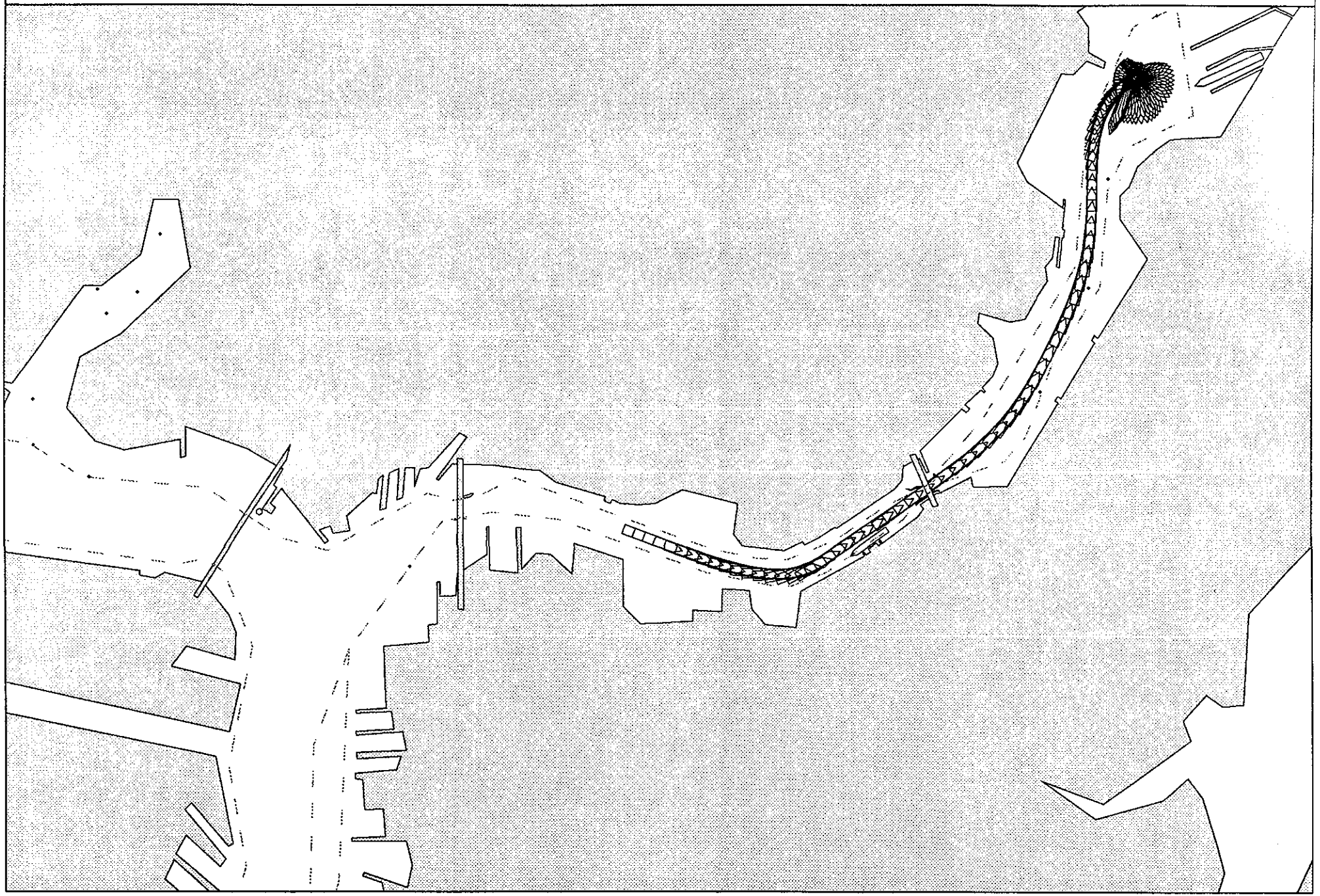
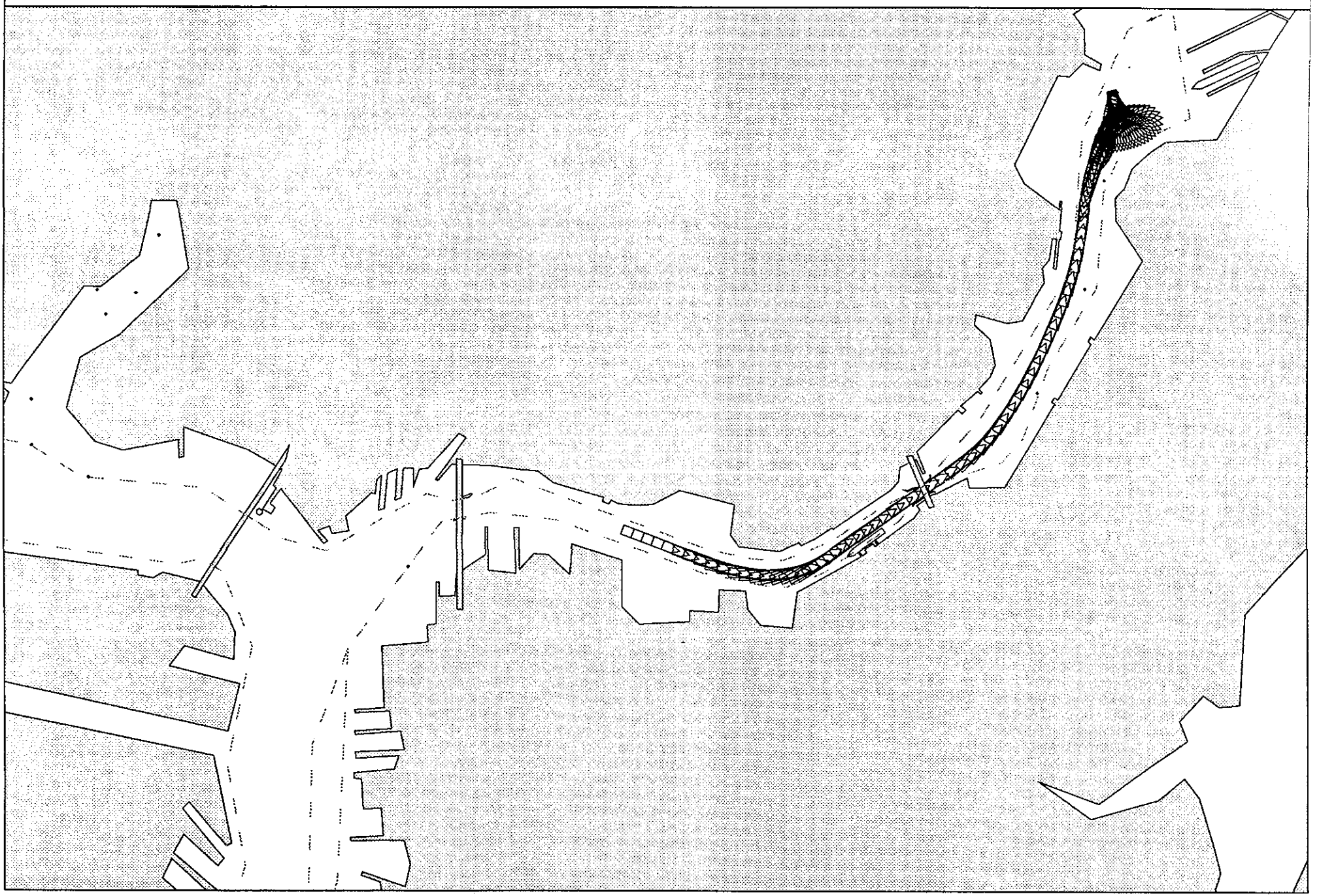


M S I / C A O R F

FILE ID :54202000 DATABASE : BOSTONP1.DB TRACK LINE :



M S I / C A O R F

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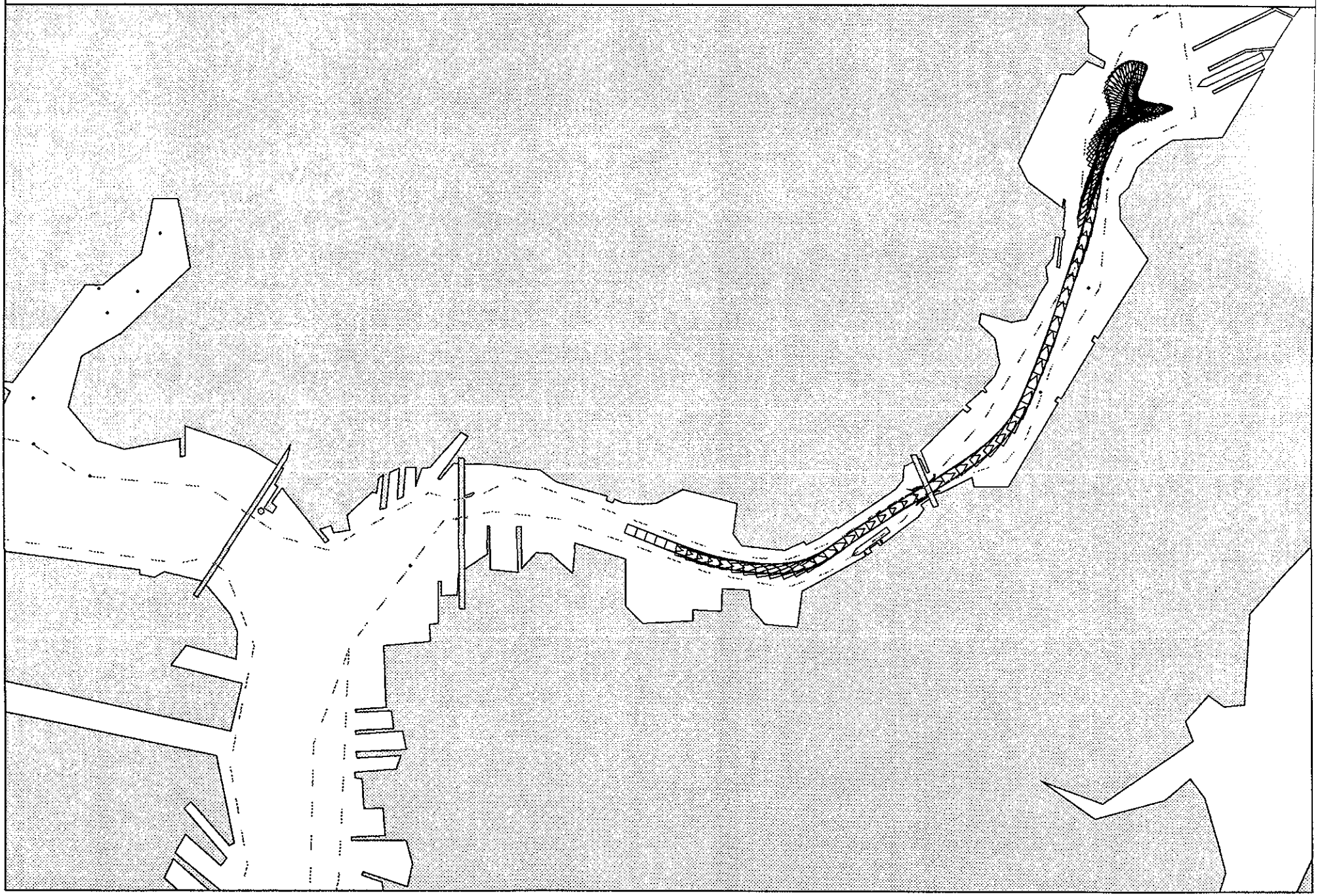

M S I / C A O R F

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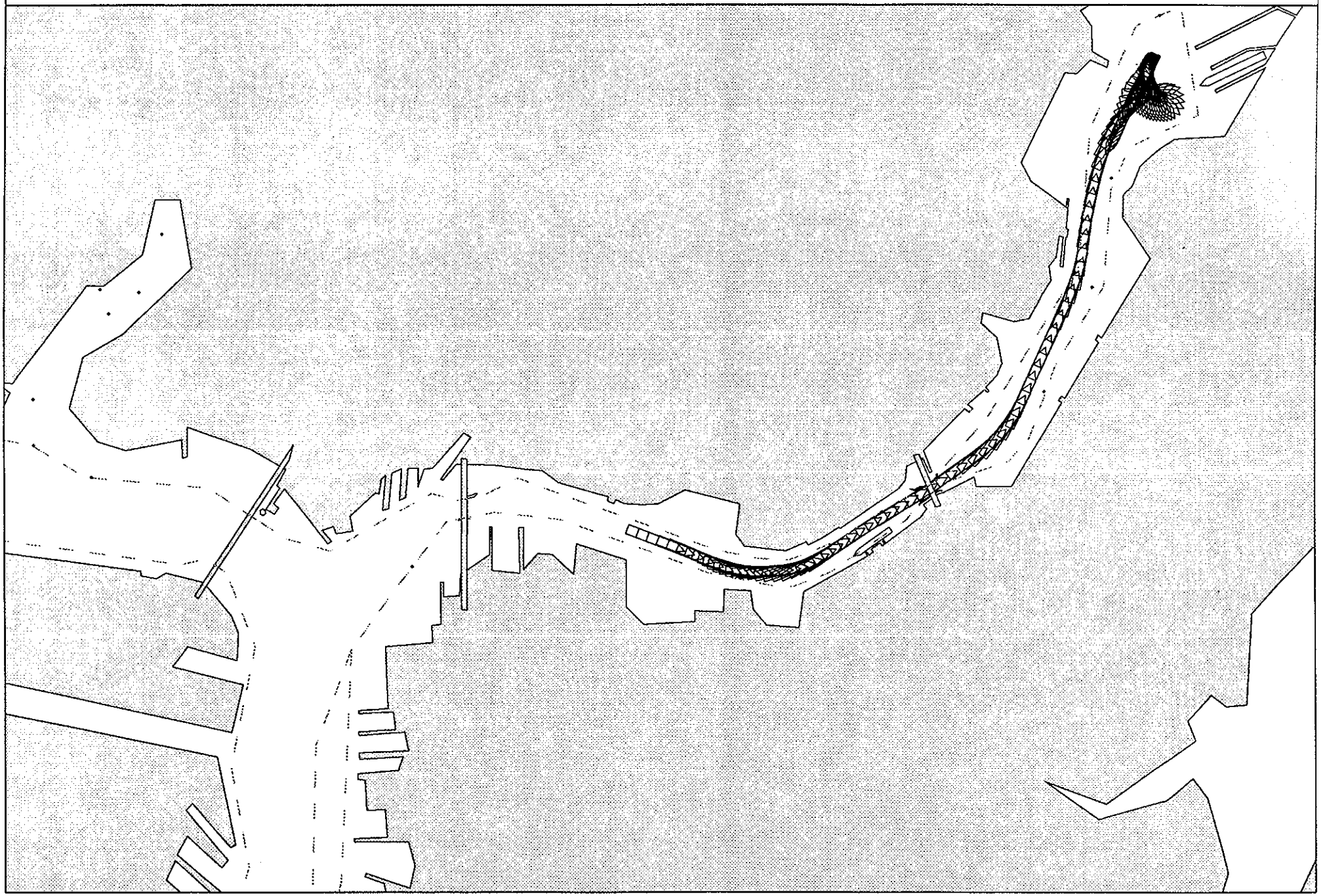
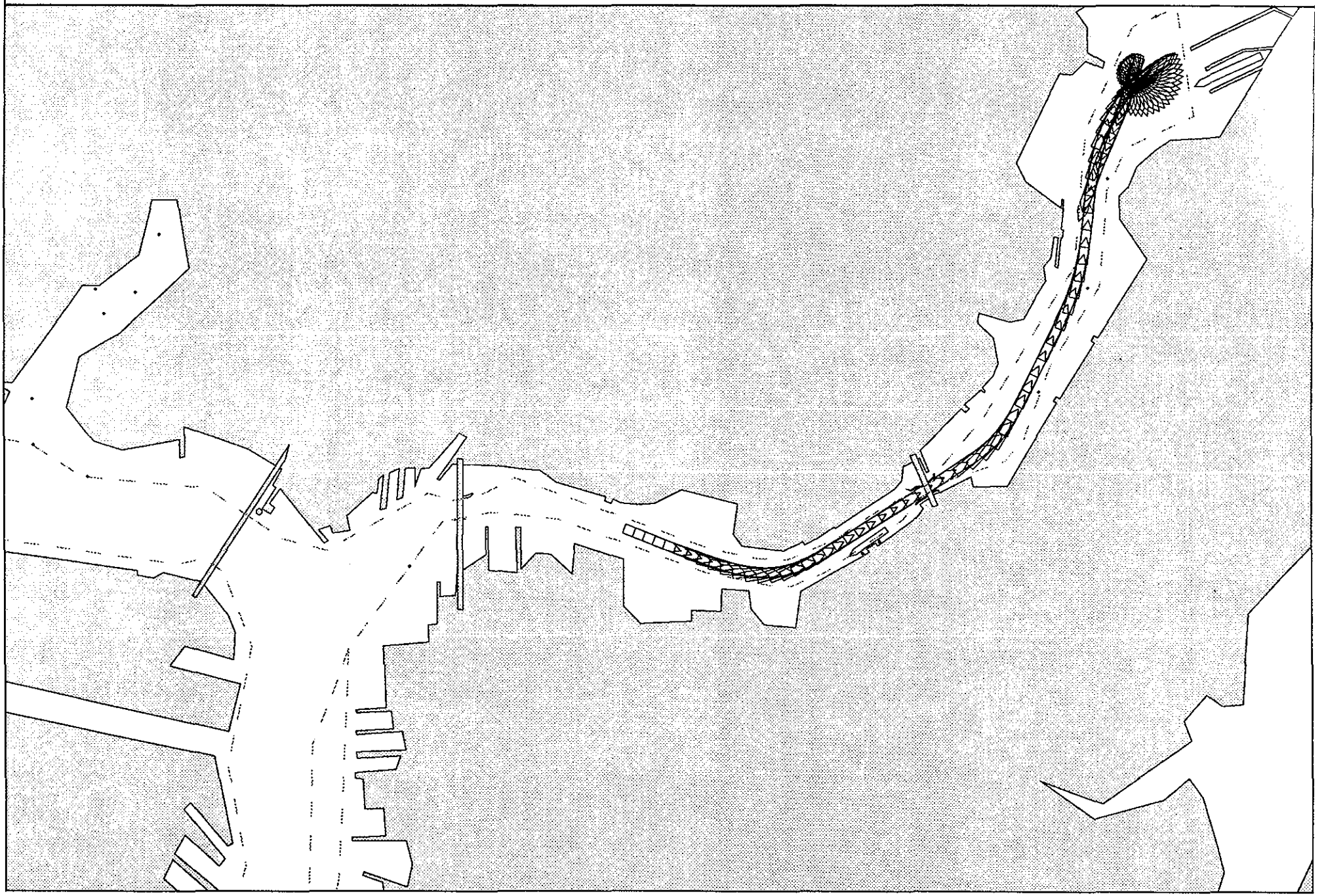
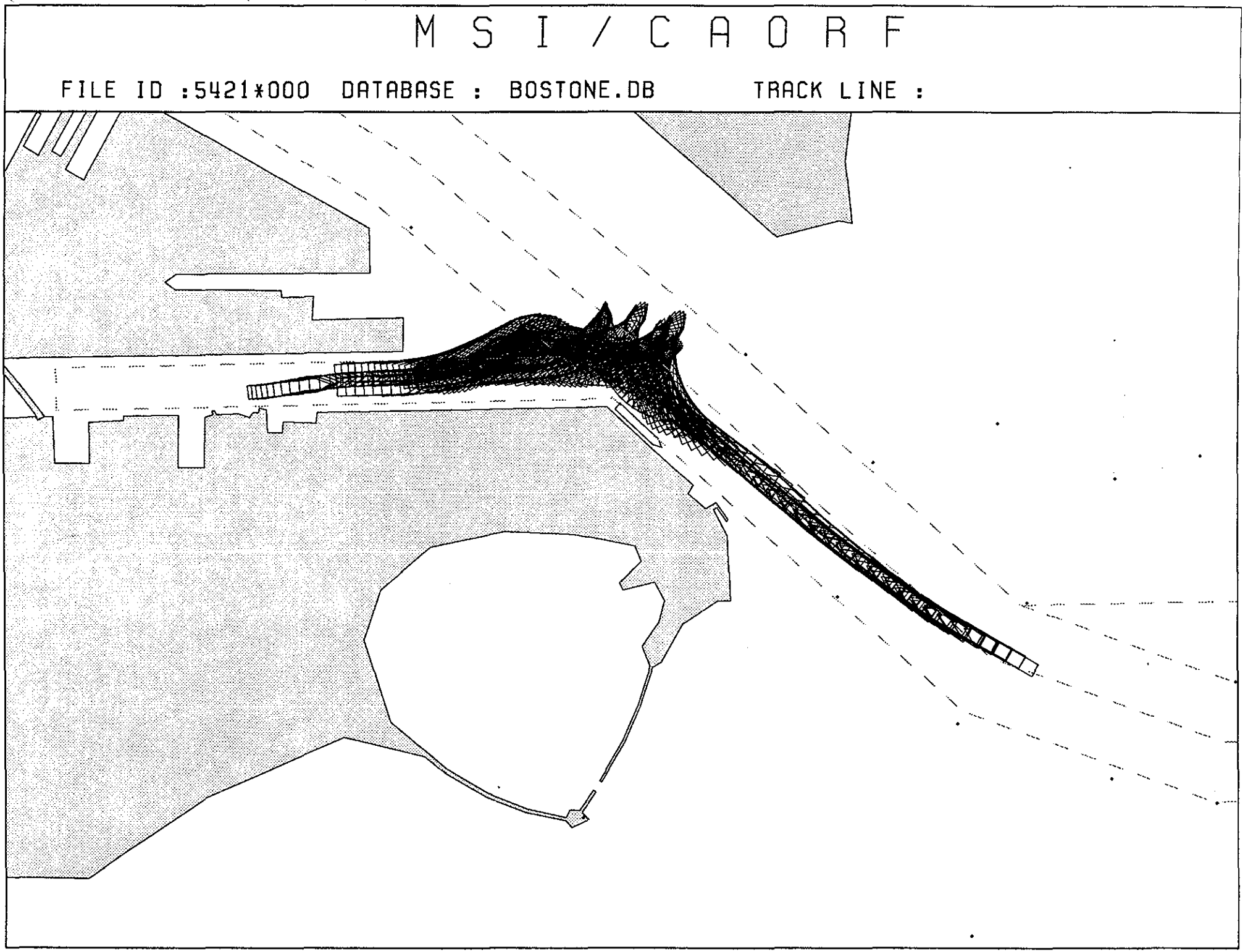


M S I / C A O R F

FILE ID :54205000 DATABASE : BOSTONP1.DB TRACK LINE :




M S I / C A O R F
FILE ID :5421*000 DATABASE : BOSTONE.DB TRACK LINE :

M S I / C A O R F

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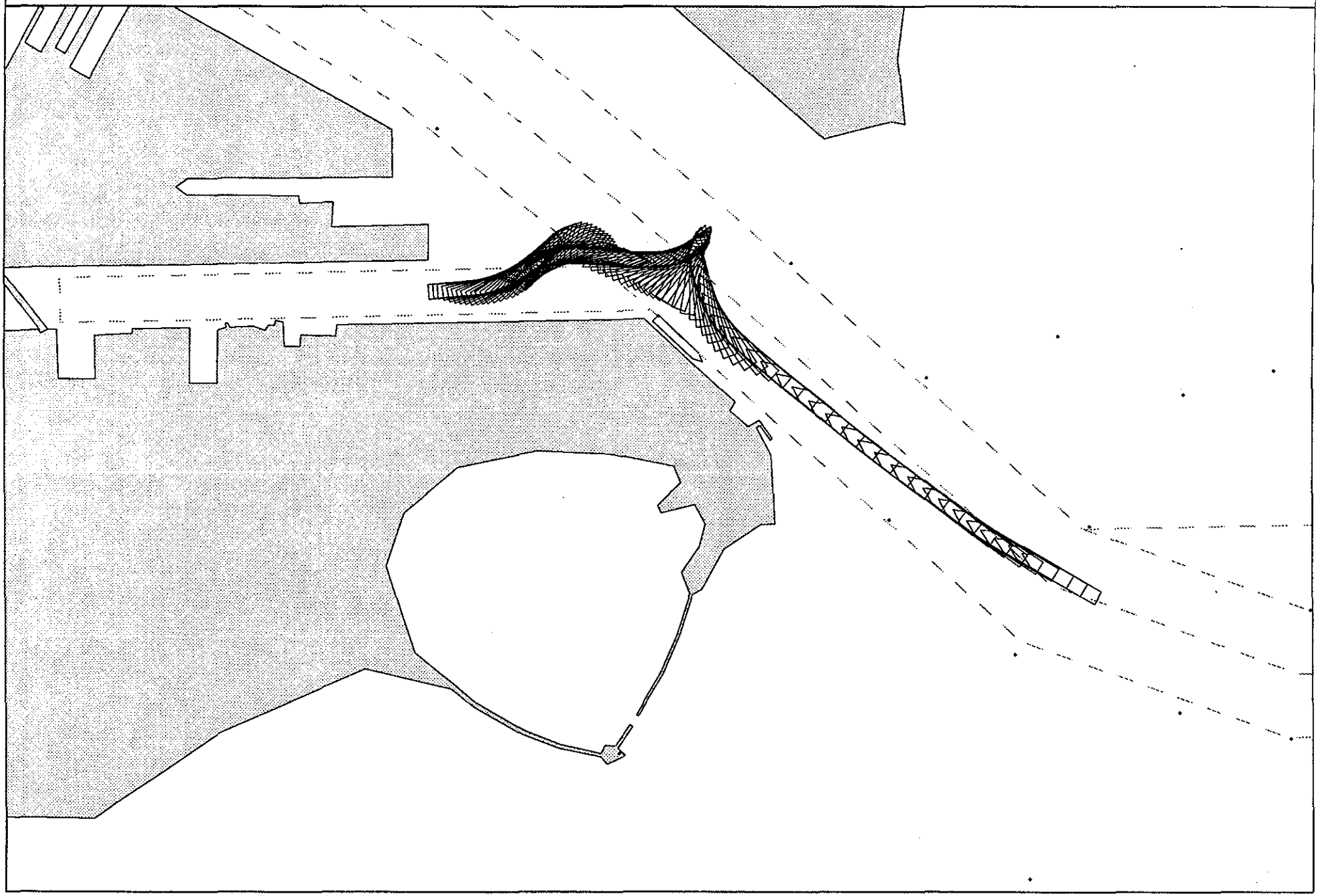

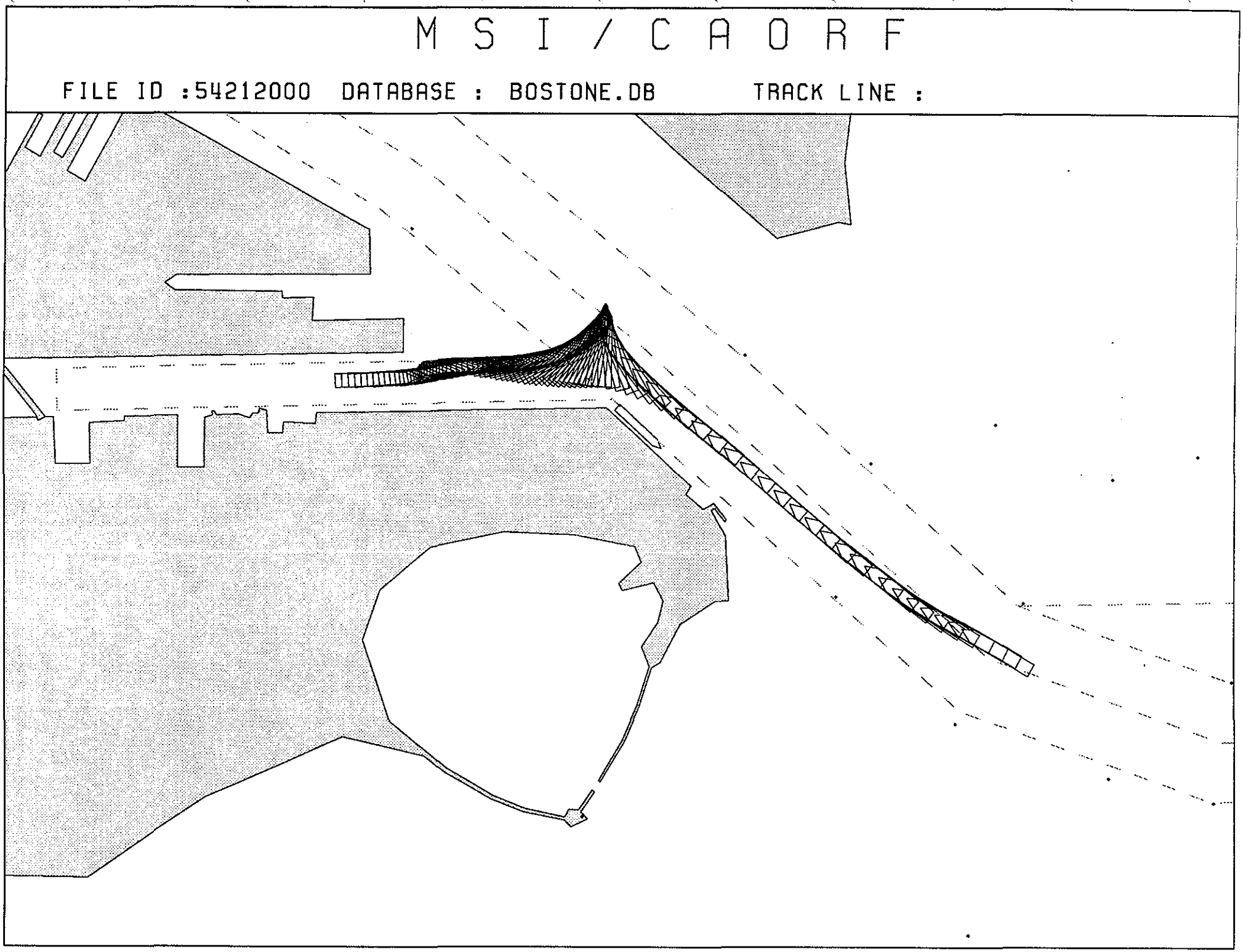
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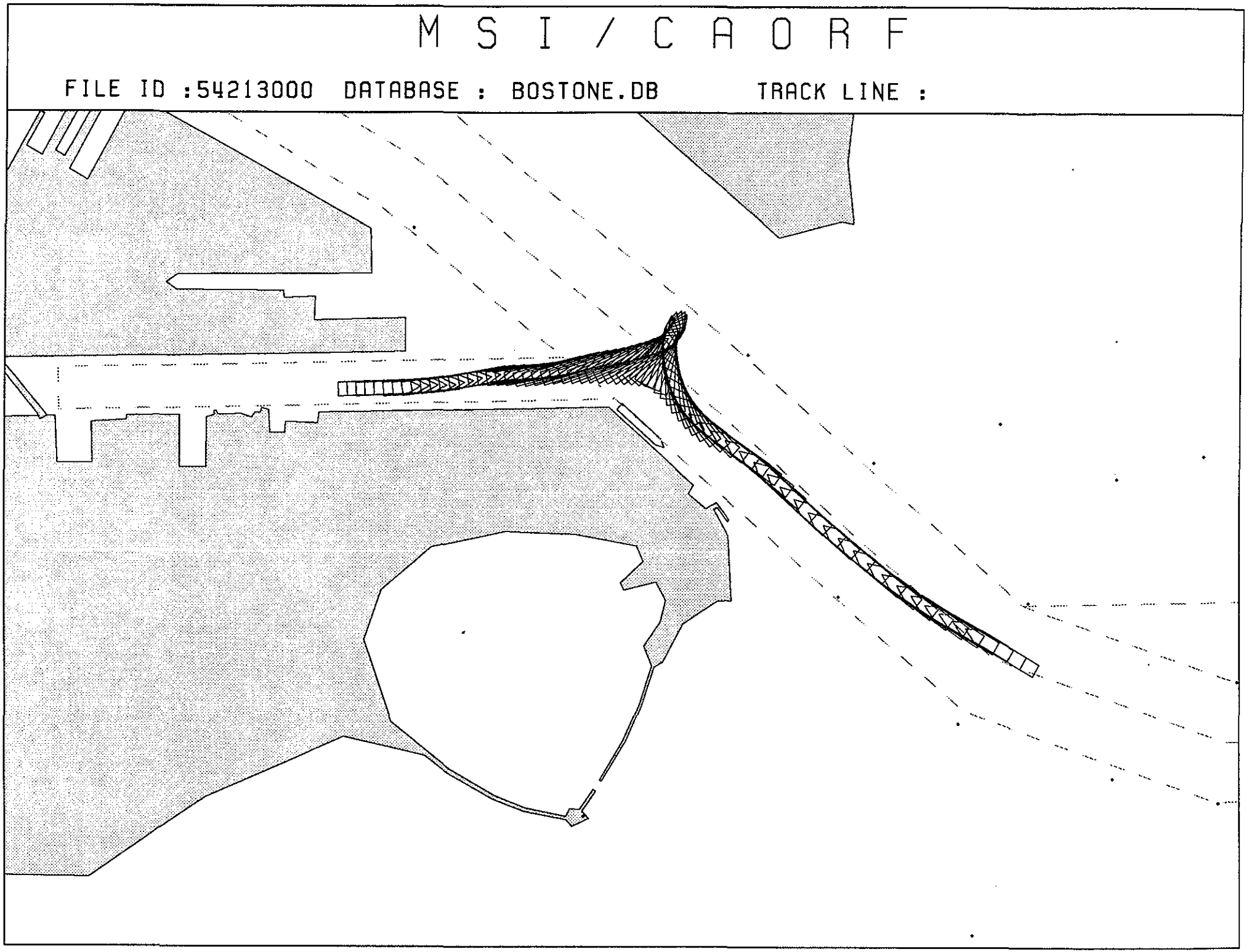
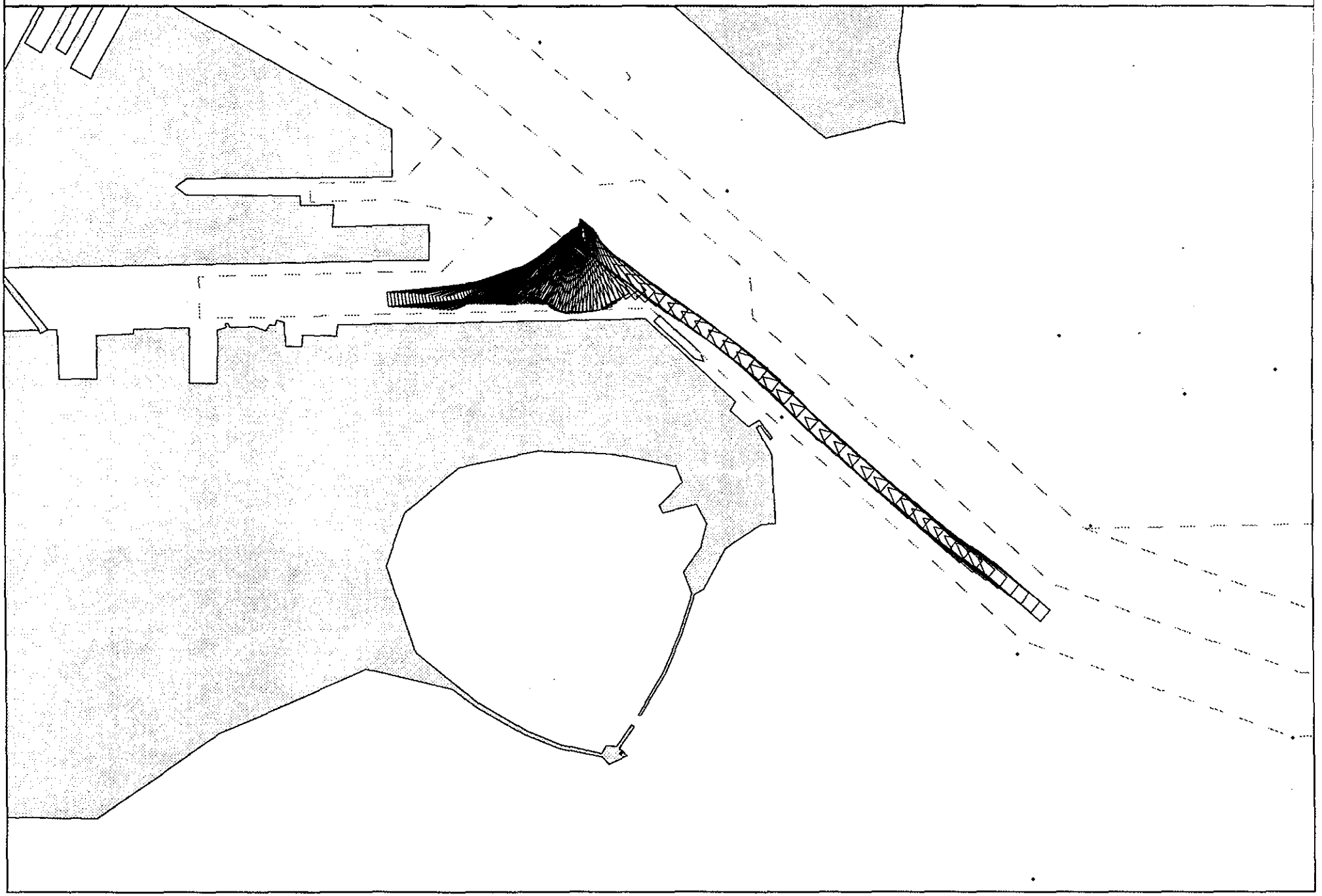

M S I / C A O R F
FILE ID :54213000 DATABASE : BOSTONE.DB TRACK LINE :

M S I / C A O R F

FILE ID :54223000 DATABASE : BOSTONP1.DB TRACK LINE :



M S I / C A O R F

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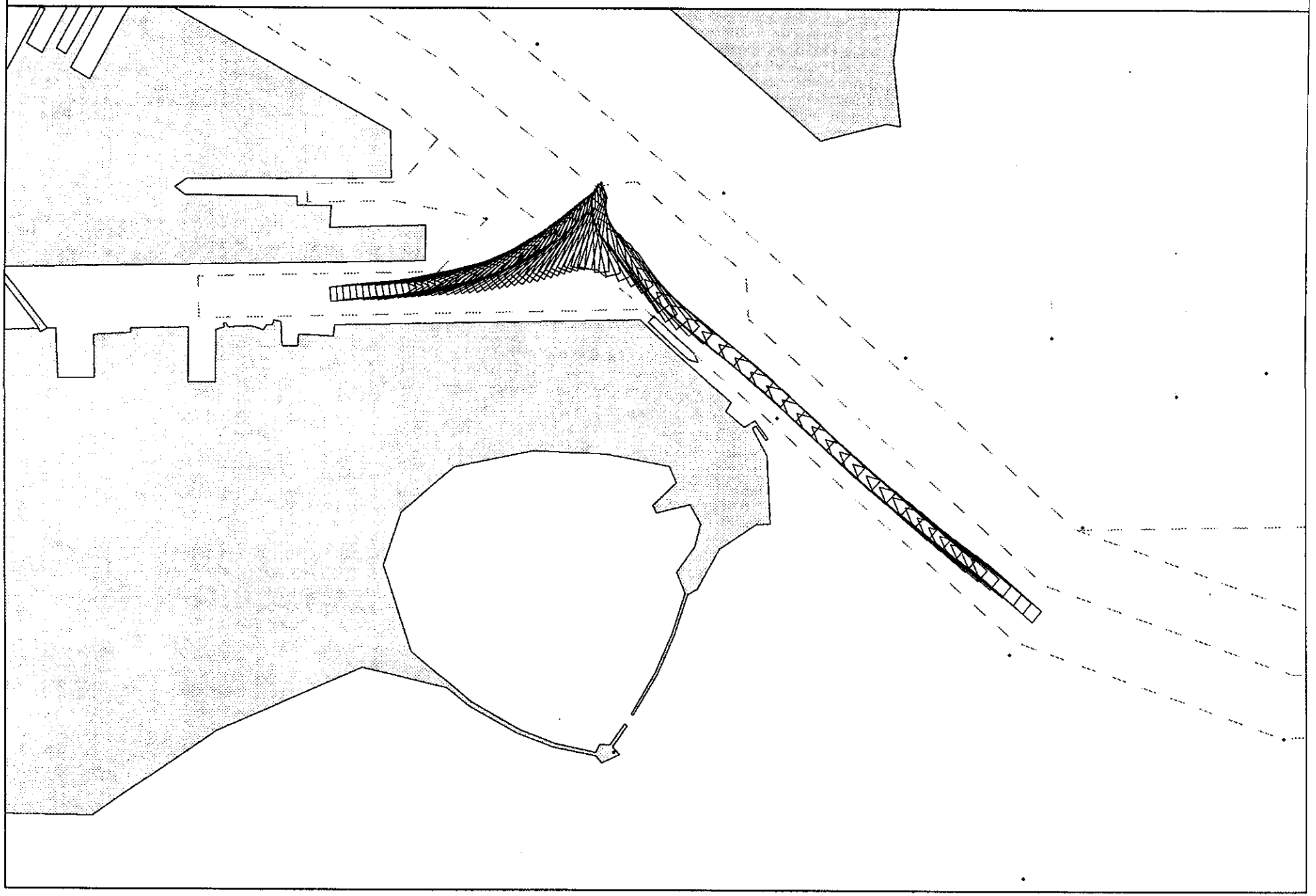

M S I / C A O R F

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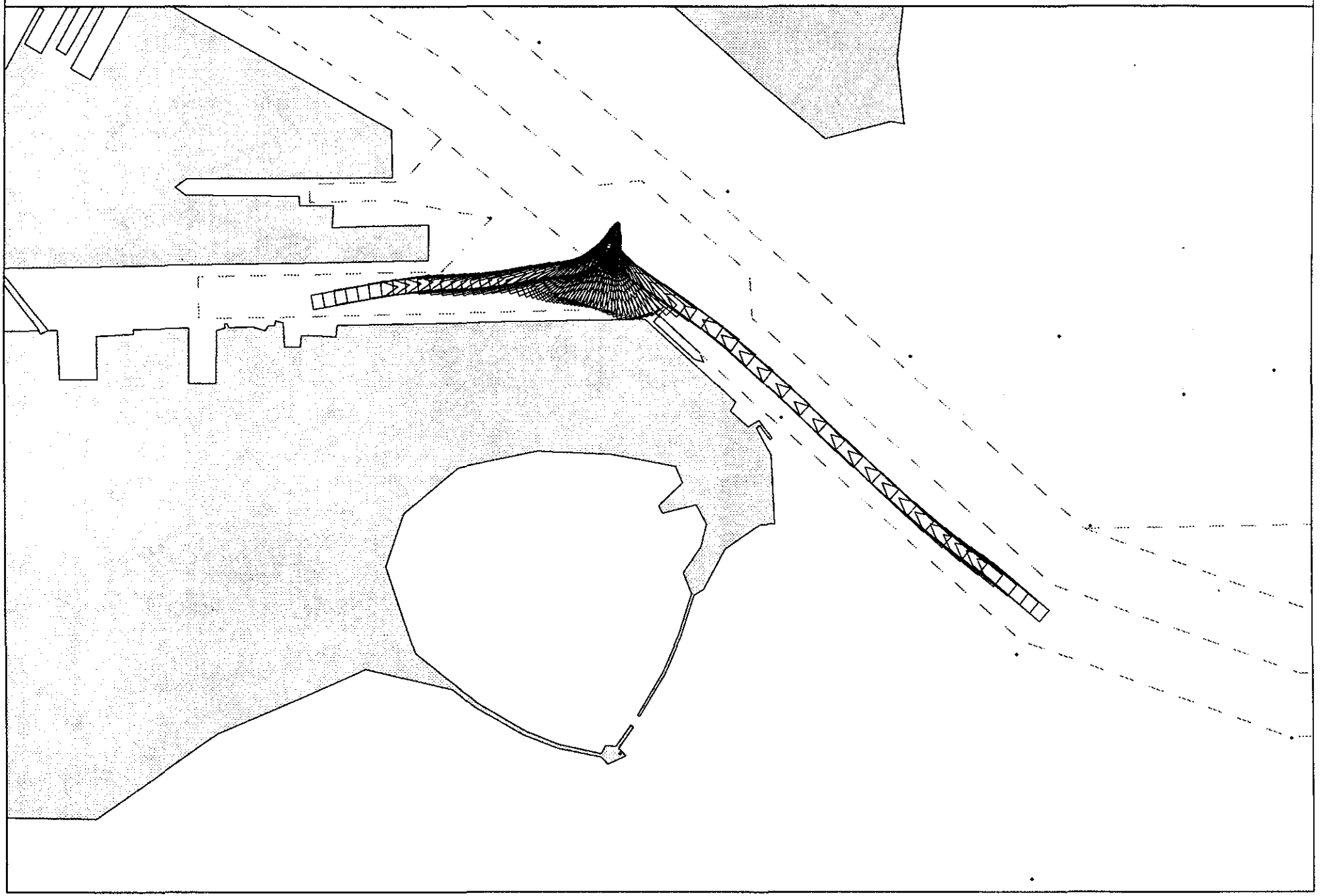

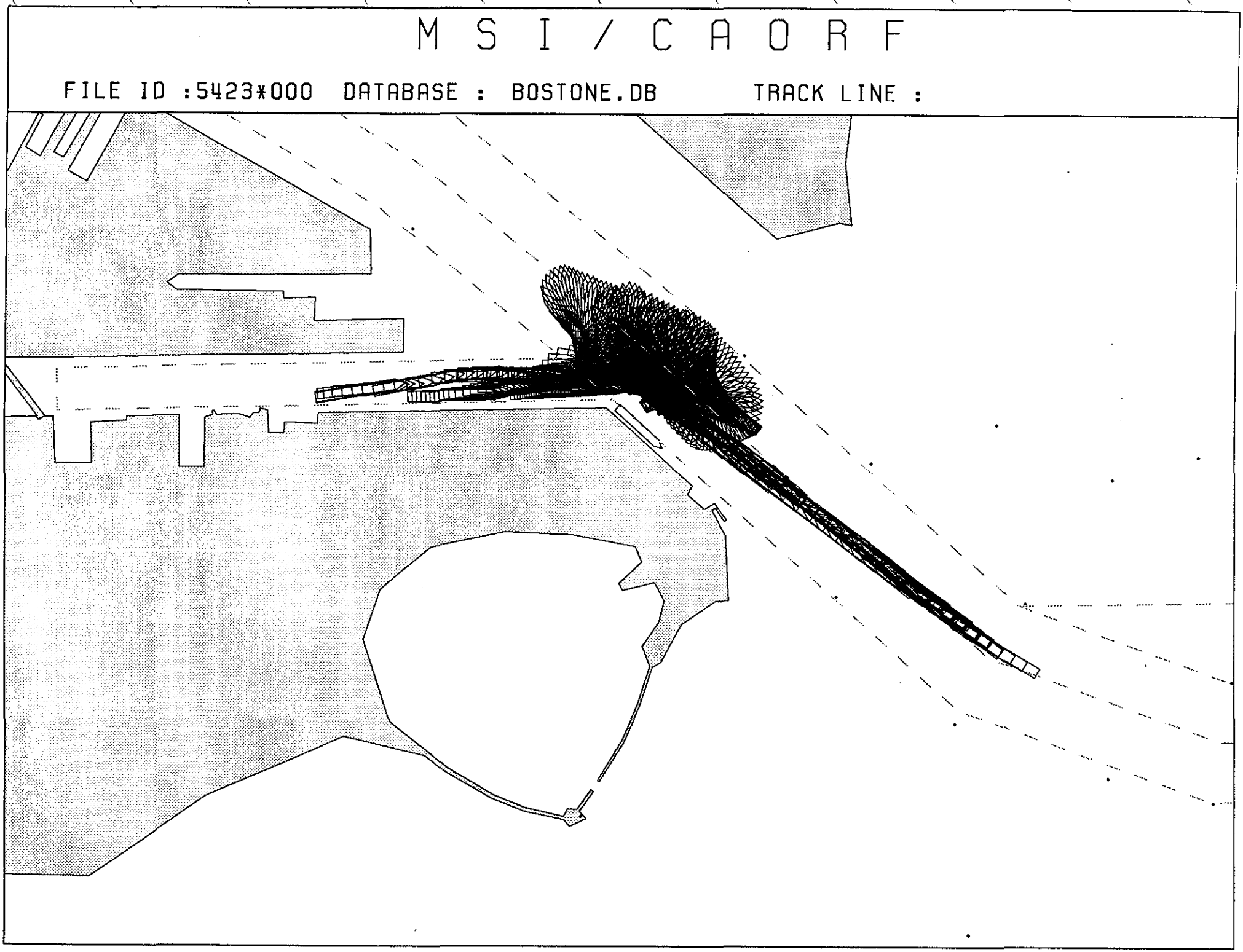
M S I / C A O R F
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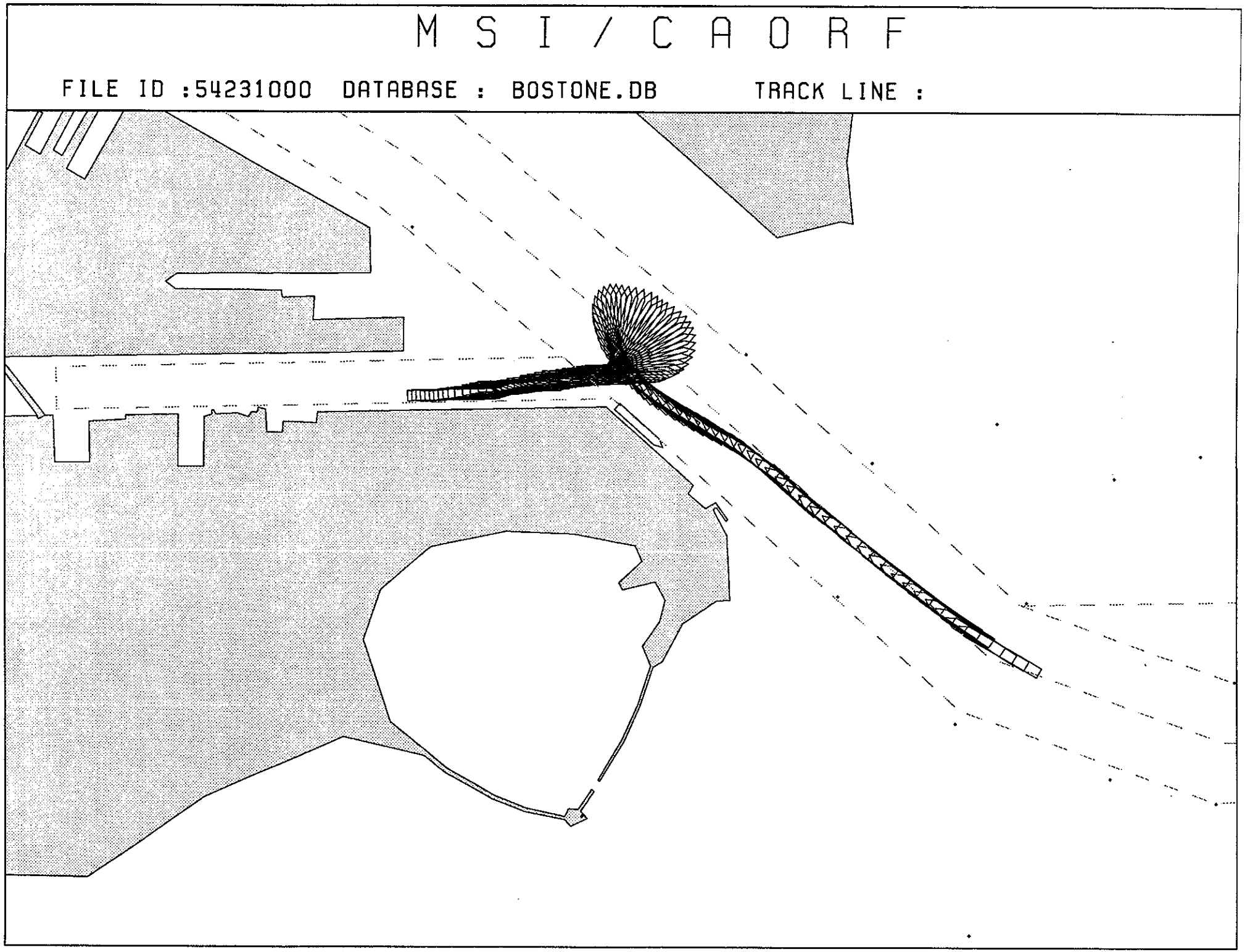
M S I / C A O R F
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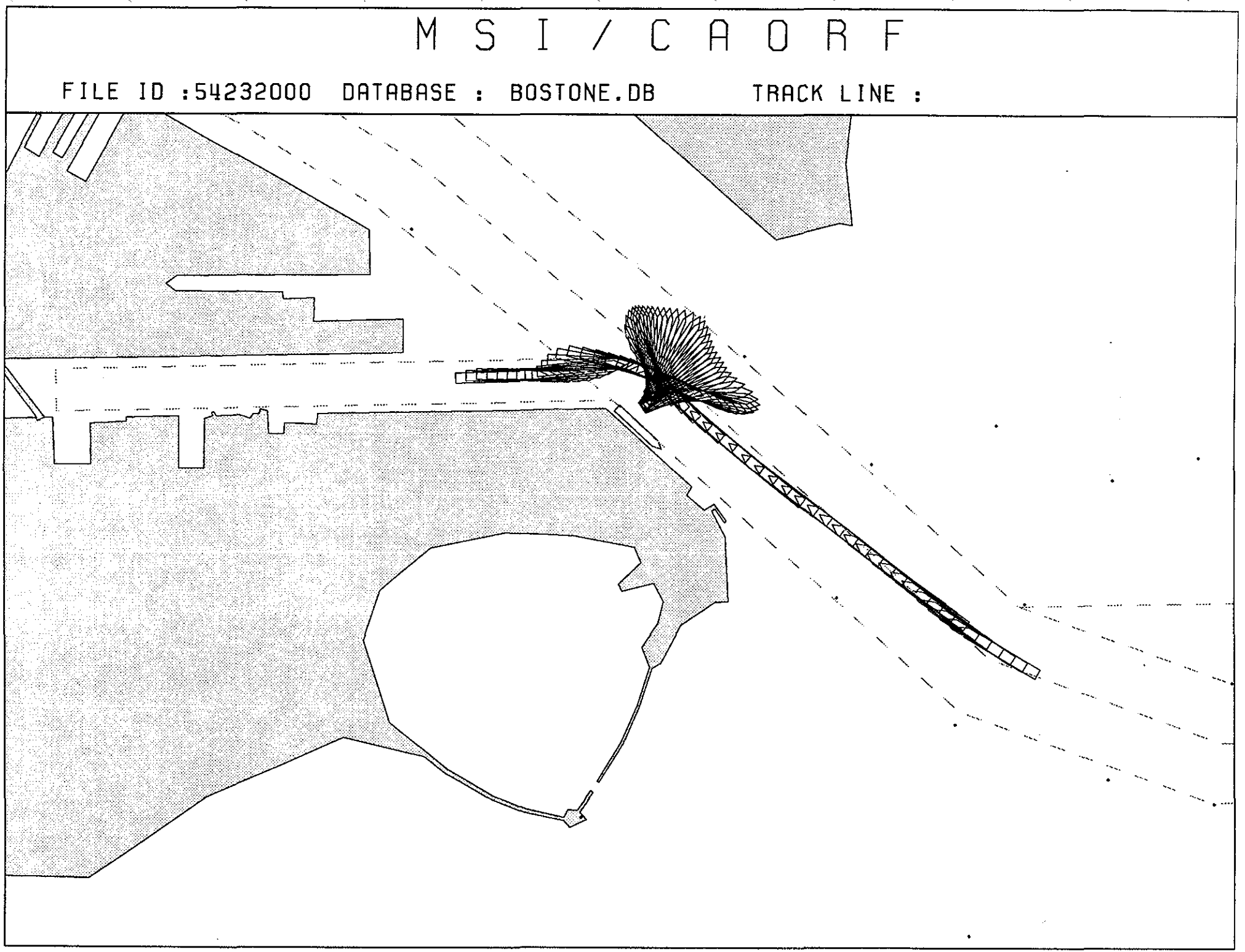
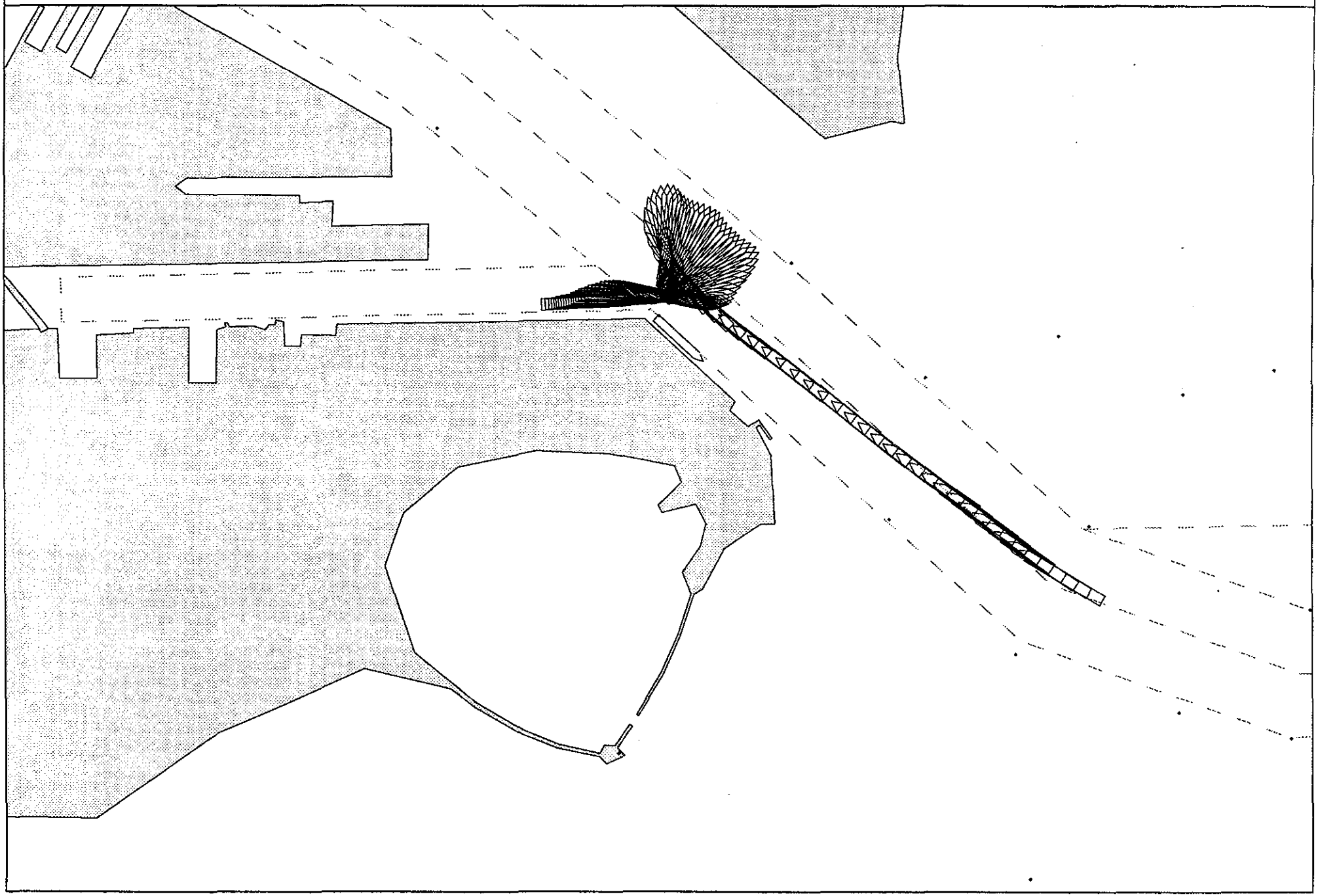
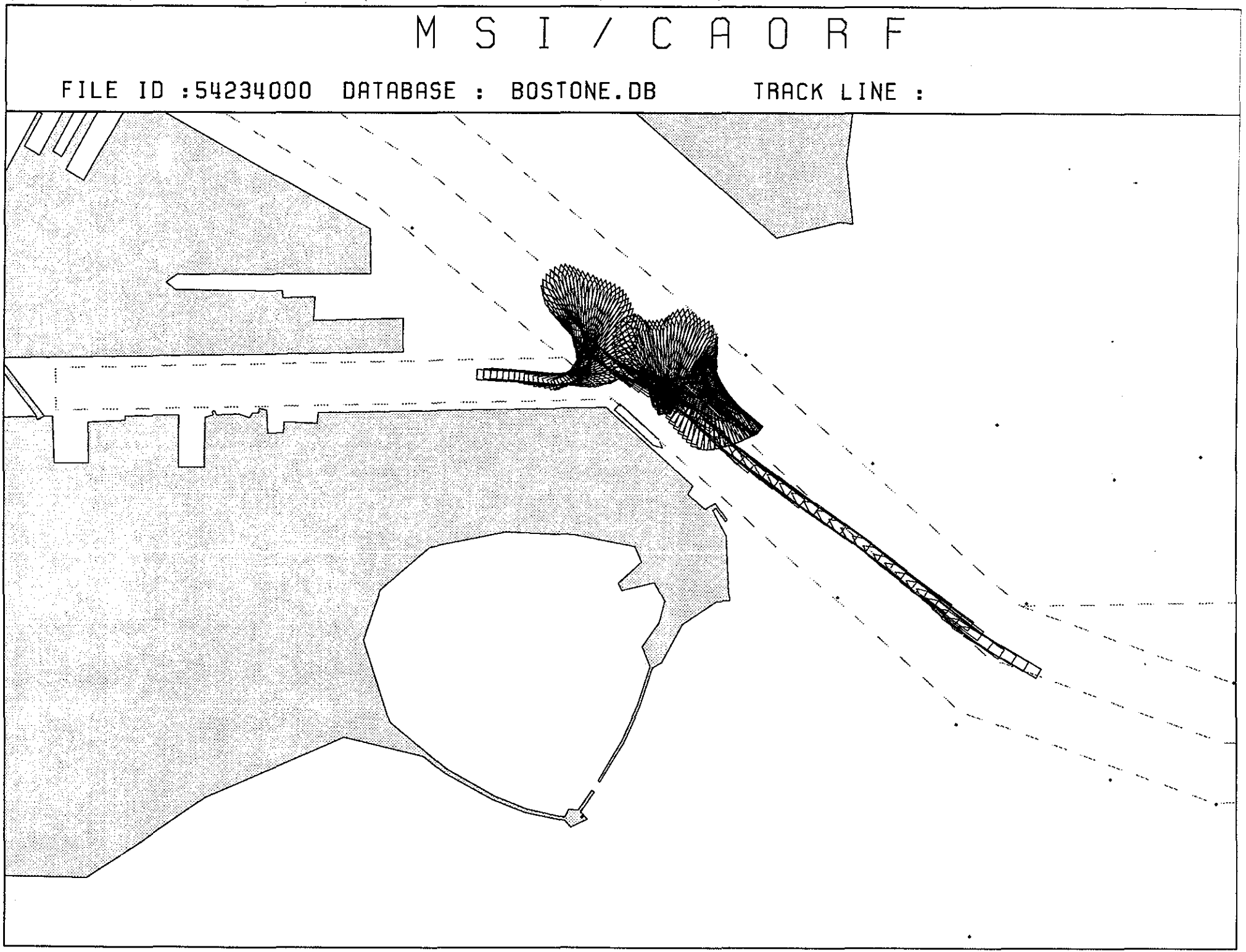

M S I / C A O R F
FILE ID :54232000 DATABASE : BOSTONE.DB TRACK LINE :

M S I / C A O R F

FILE ID :54233000 DATABASE : BOSTONE.DB TRACK LINE :




M S I / C A O R F
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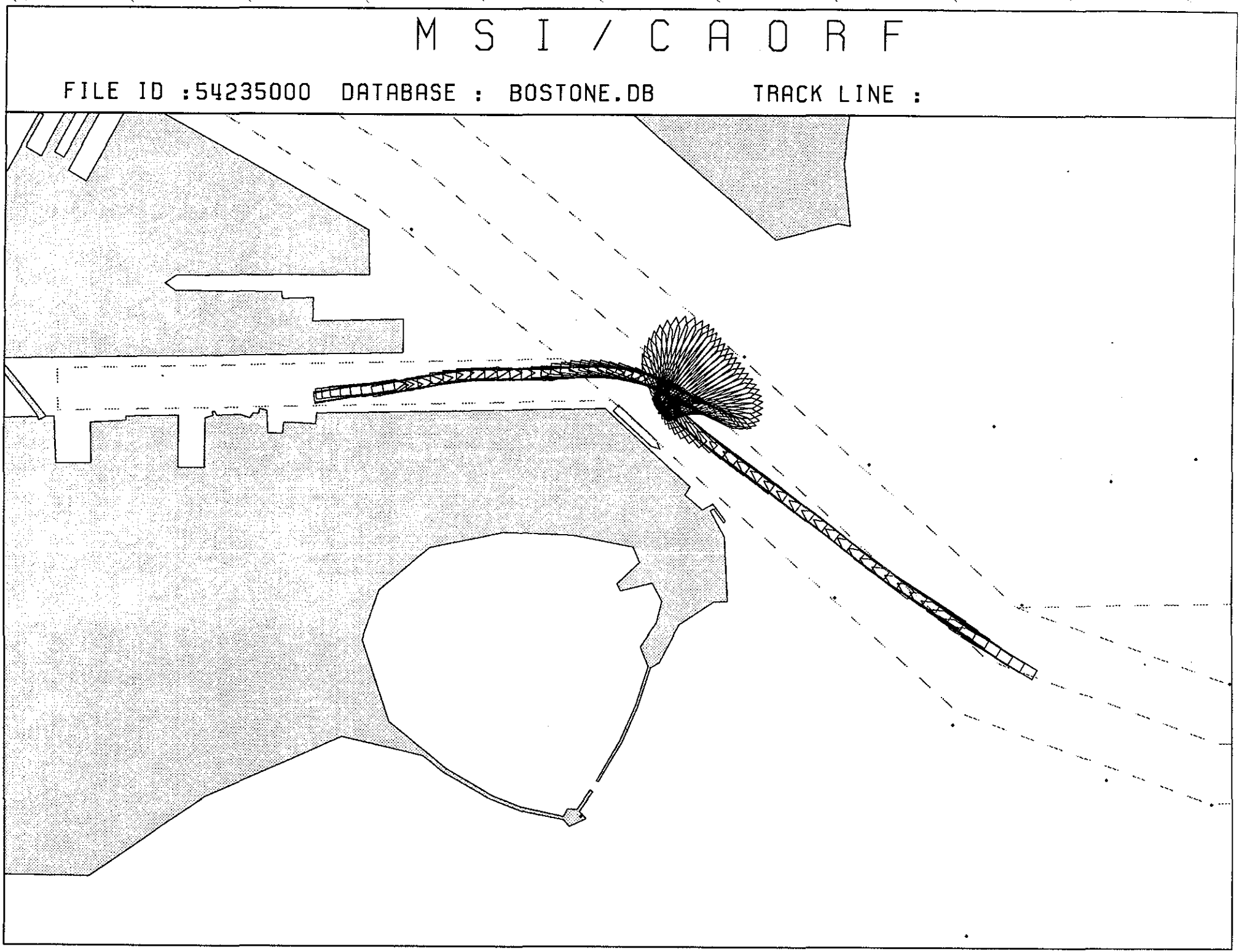
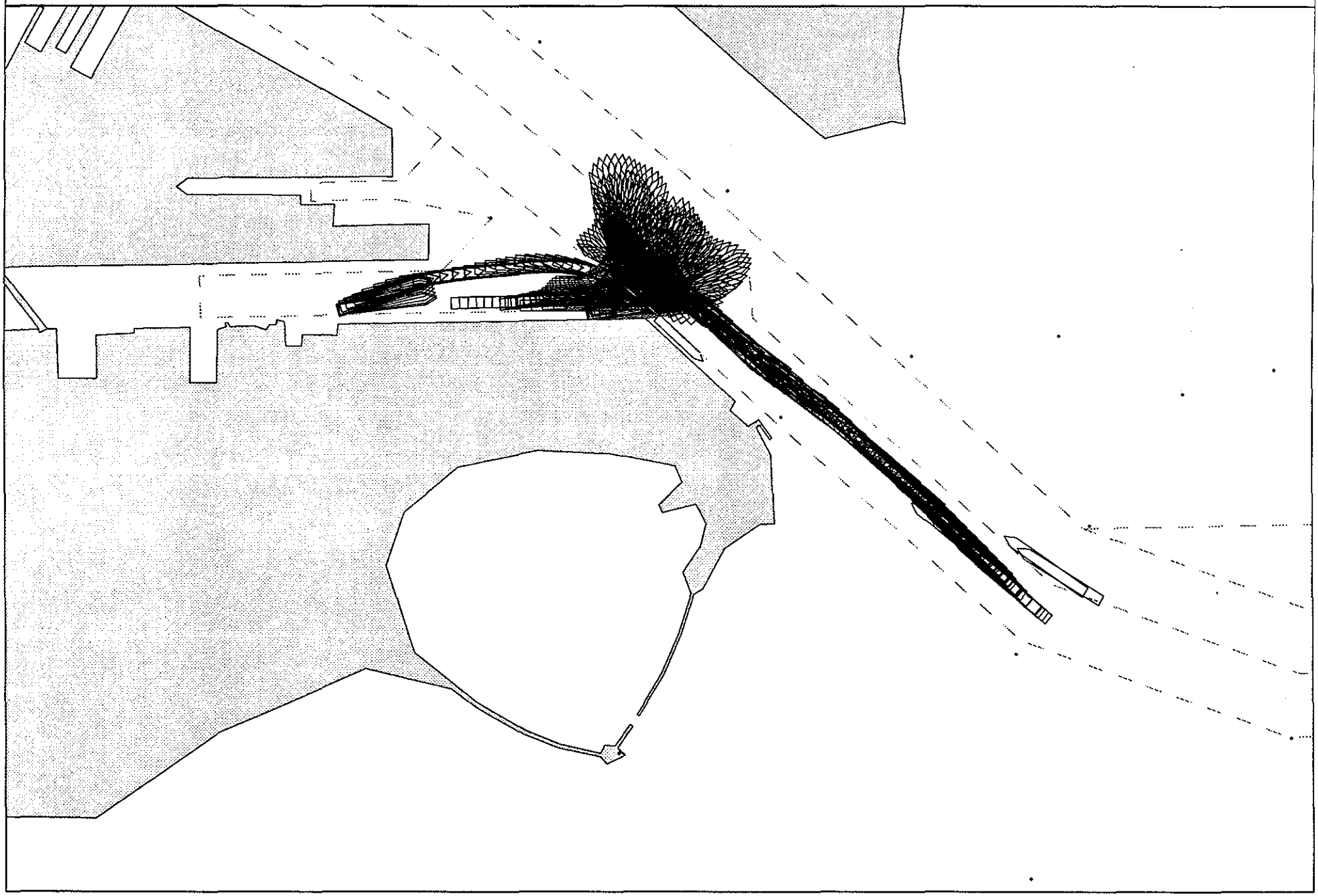
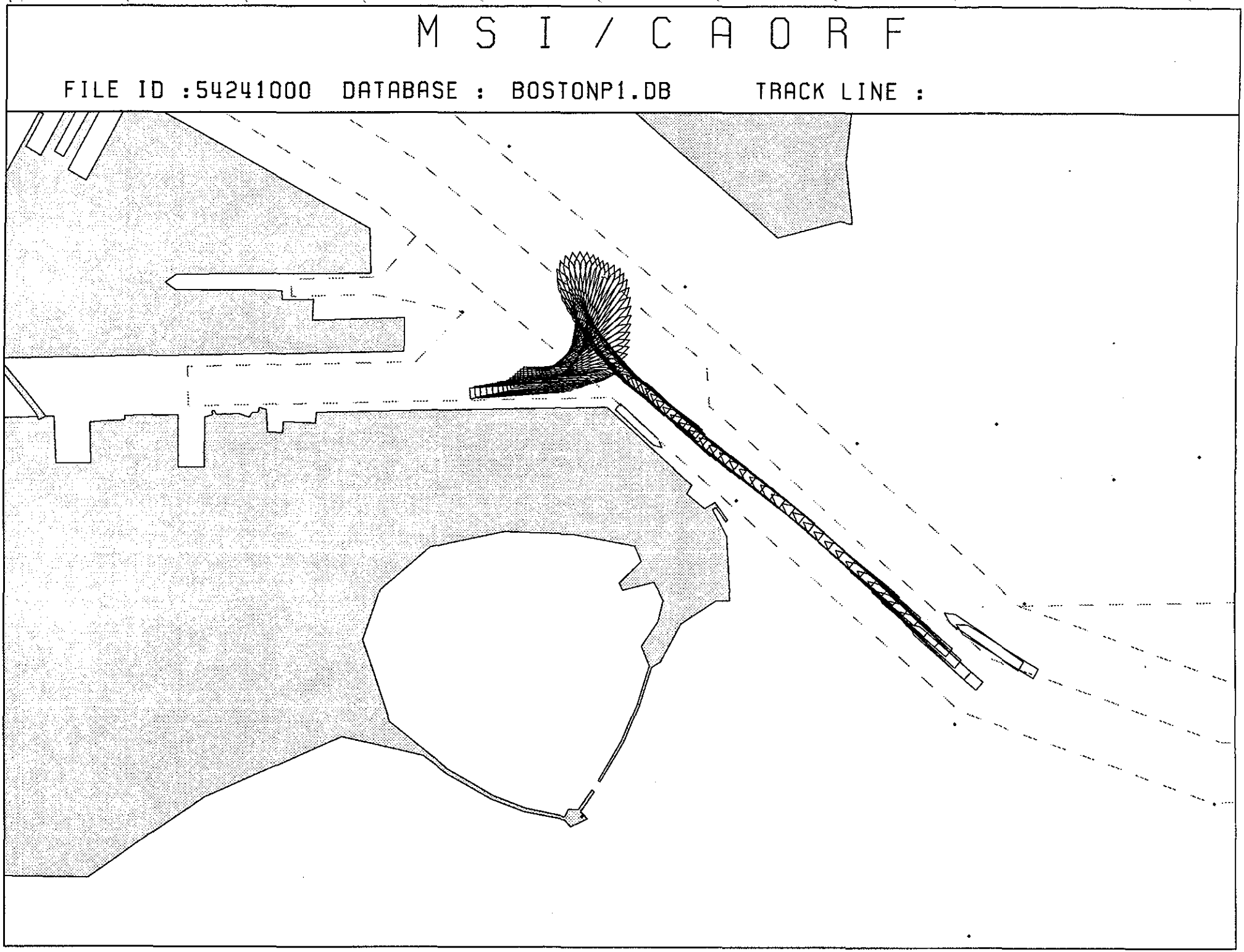
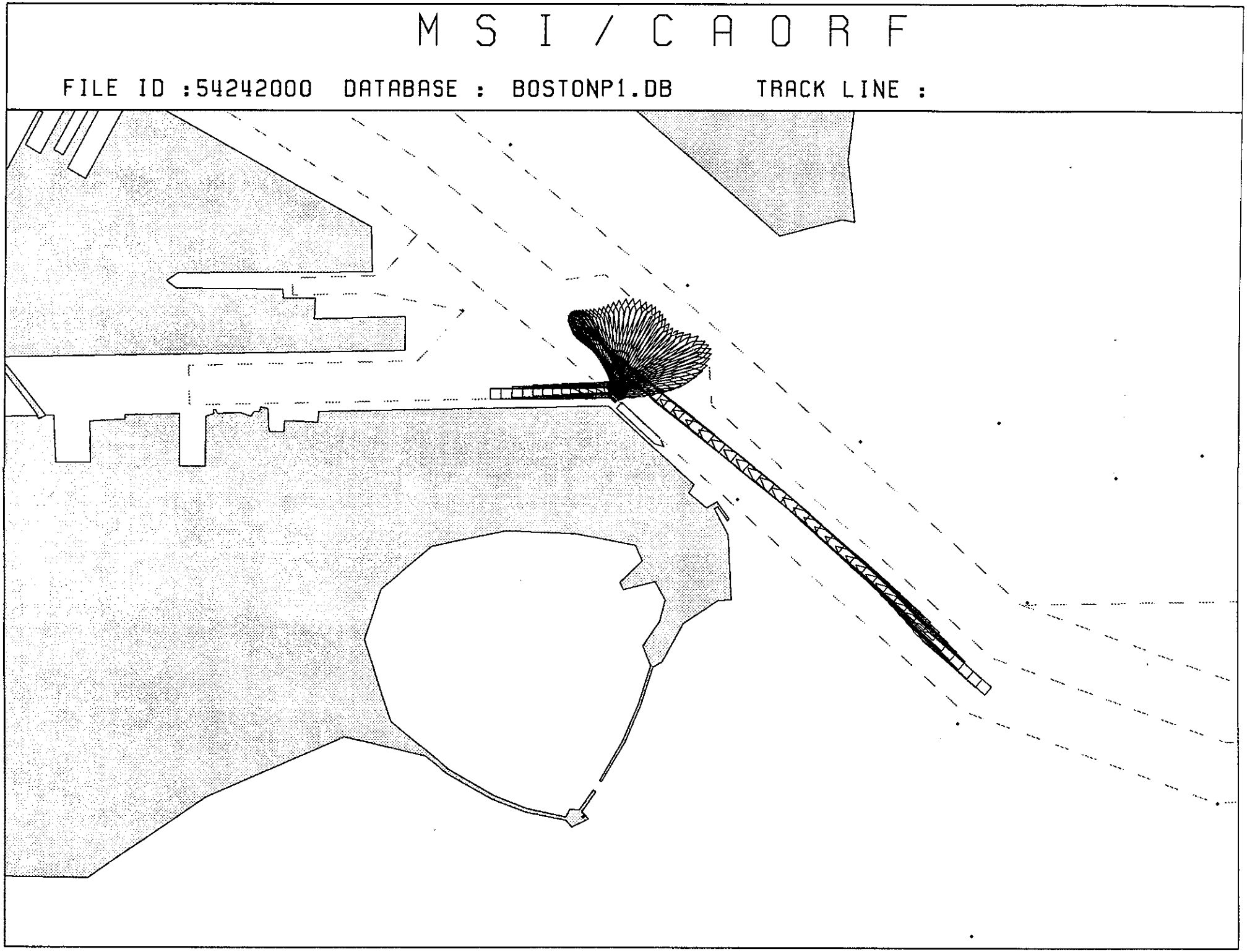

M S I / C A O R F
FILE ID :54235000 DATABASE : BOSTONE.DB TRACK LINE :

M S I / C A O R F

FILE ID :5424*000 DATABASE : BOSTONP1.DB TRACK LINE :

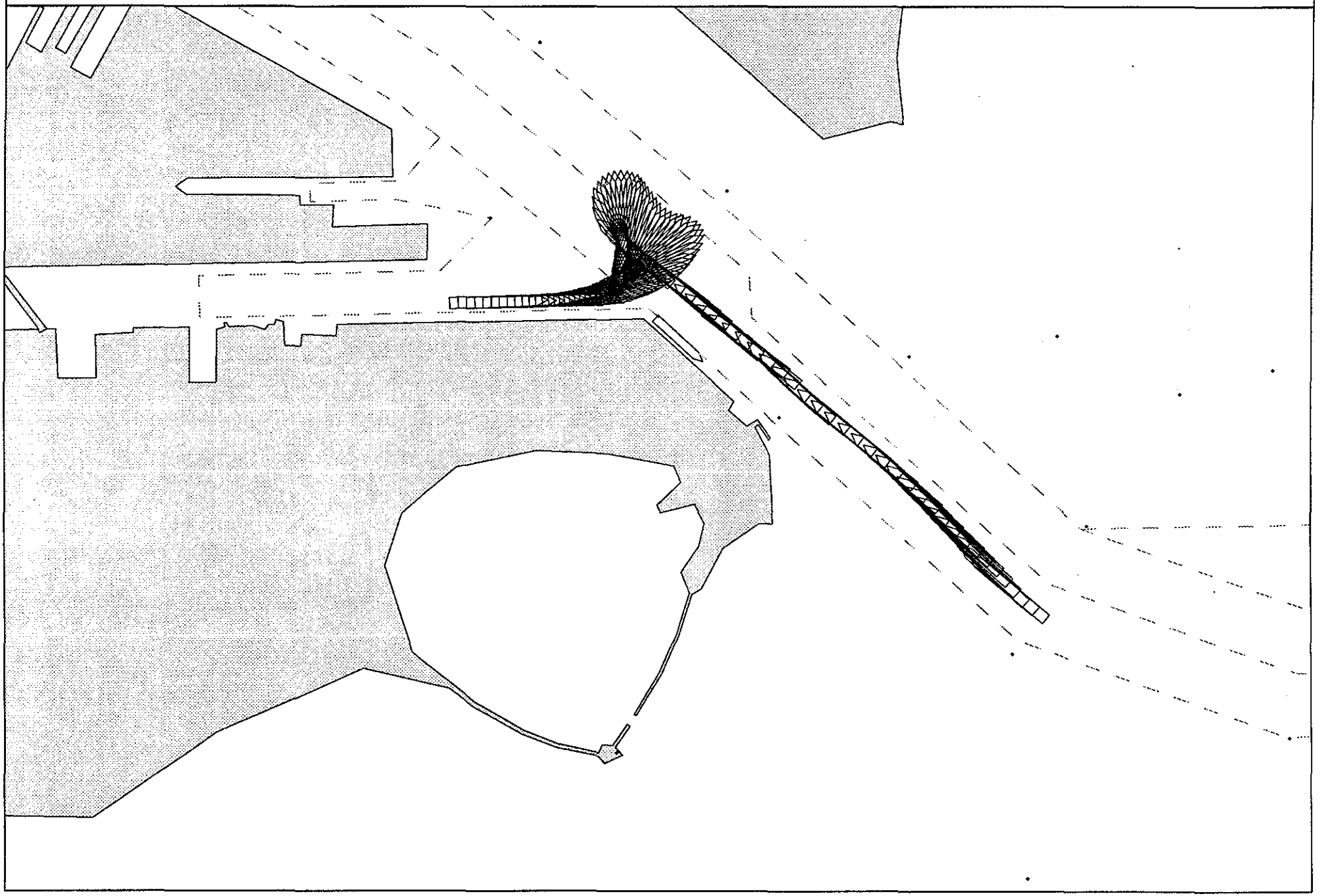


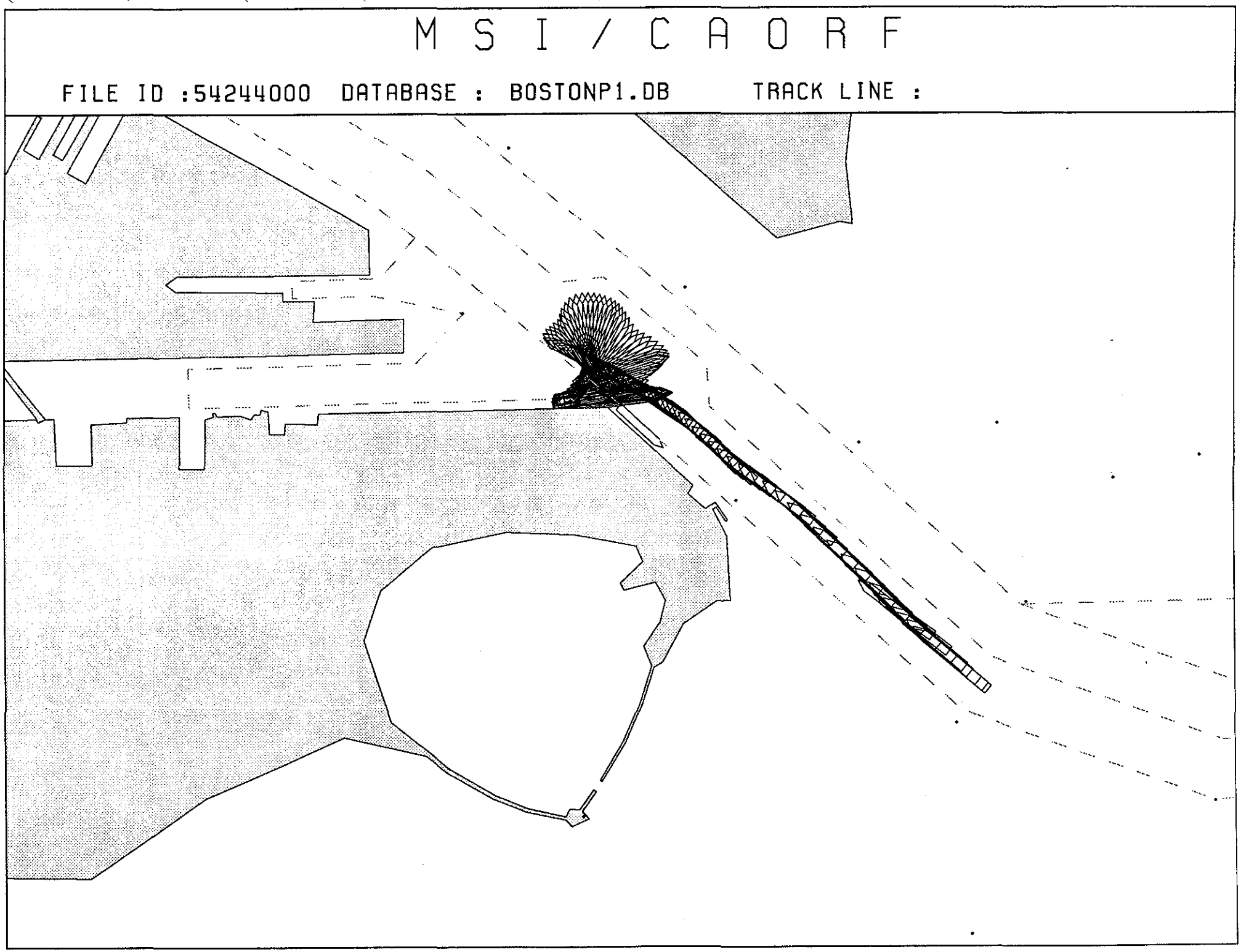

M S I / C A O R F
FILE ID :54241000 DATABASE : BOSTONP1.DB TRACK LINE :


M S I / C A O R F
FILE ID :54242000 DATABASE : BOSTONP1.DB TRACK LINE :

M S I / C A O R F

FILE ID :54243000 DATABASE : BOSTONP1.DB TRACK LINE :




M S I / C A O R F
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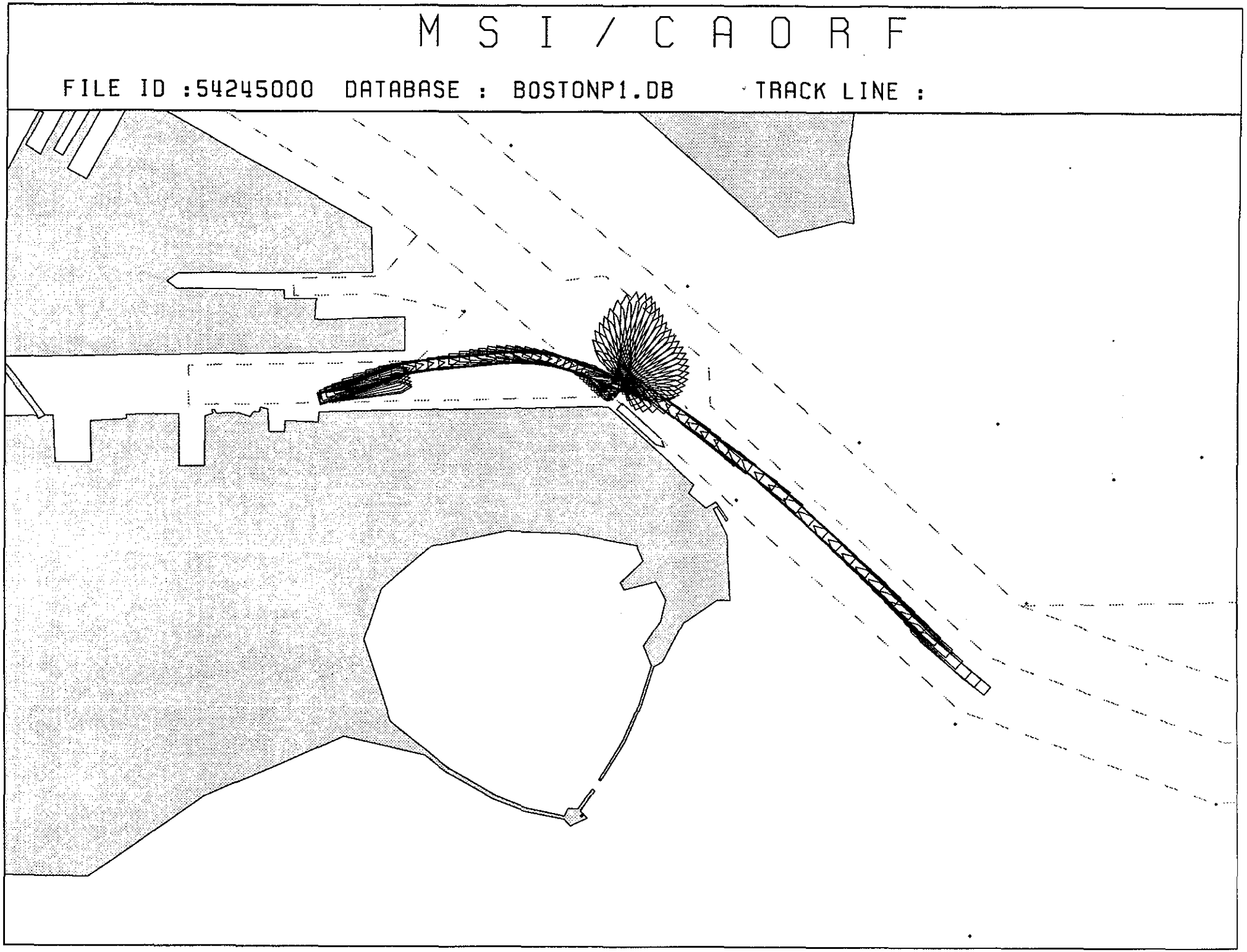
M S I / C A O R F
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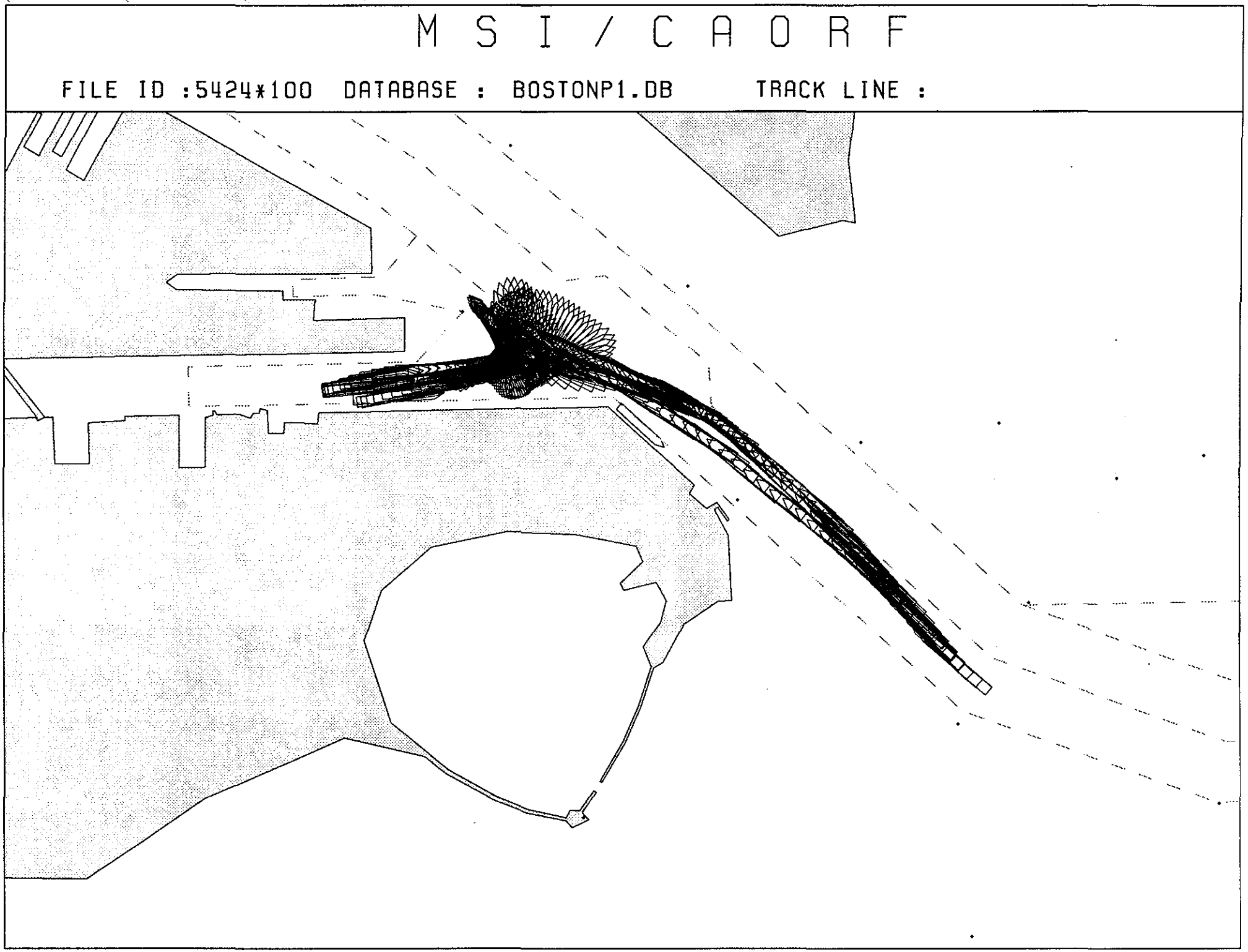
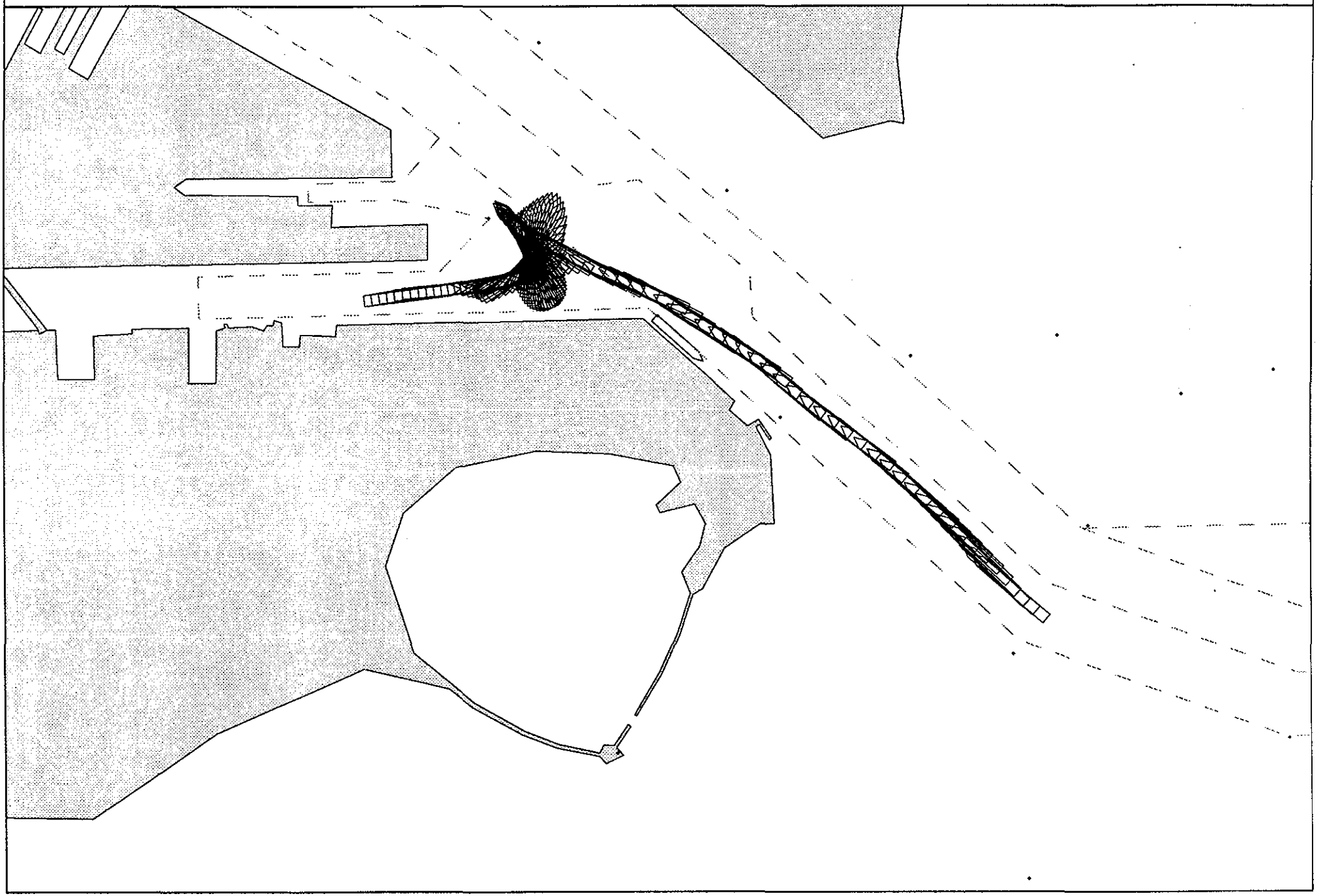
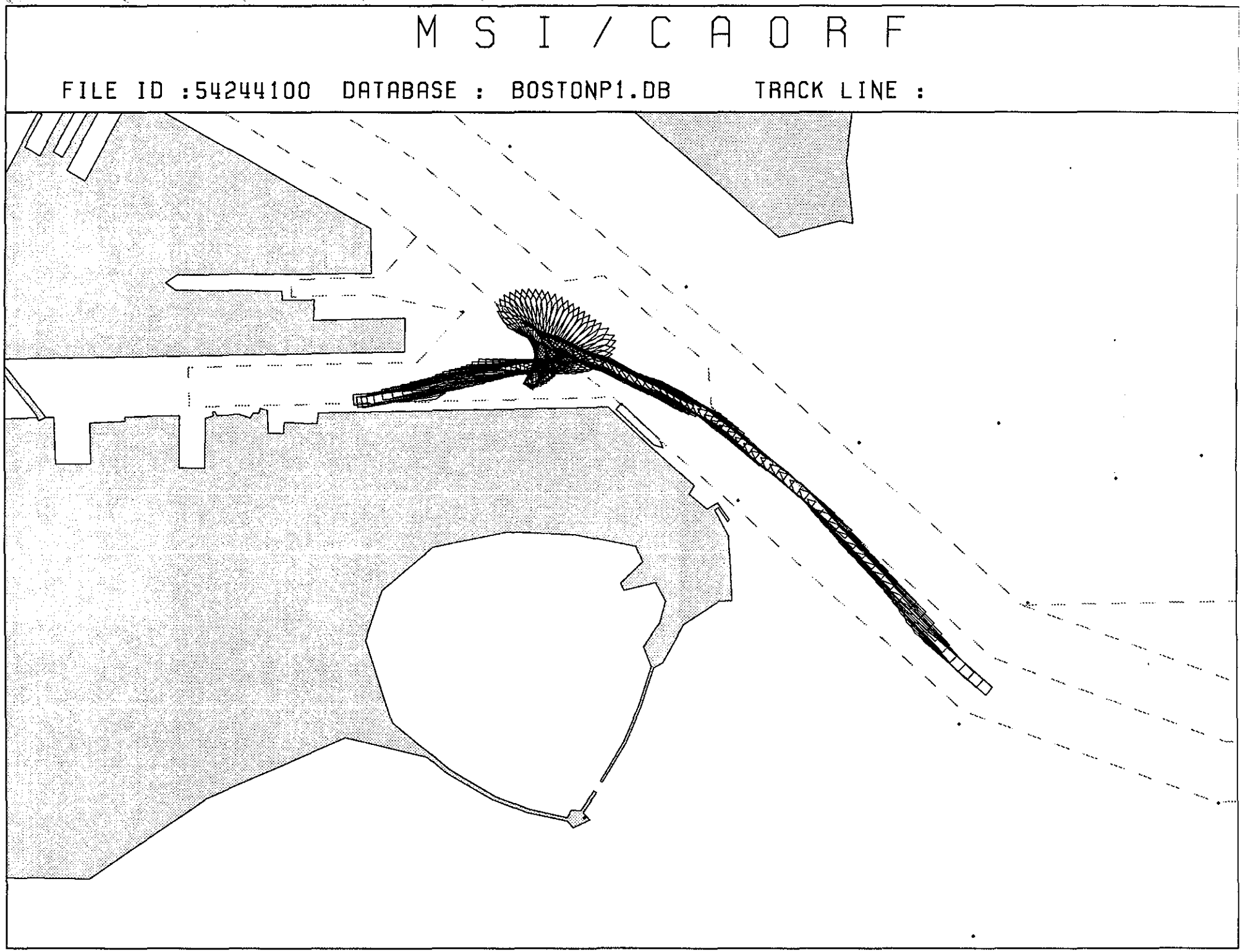

M S I / C A O R F
FILE ID :5424*100 DATABASE : BOSTONP1.DB TRACK LINE :

M S I / C A O R F

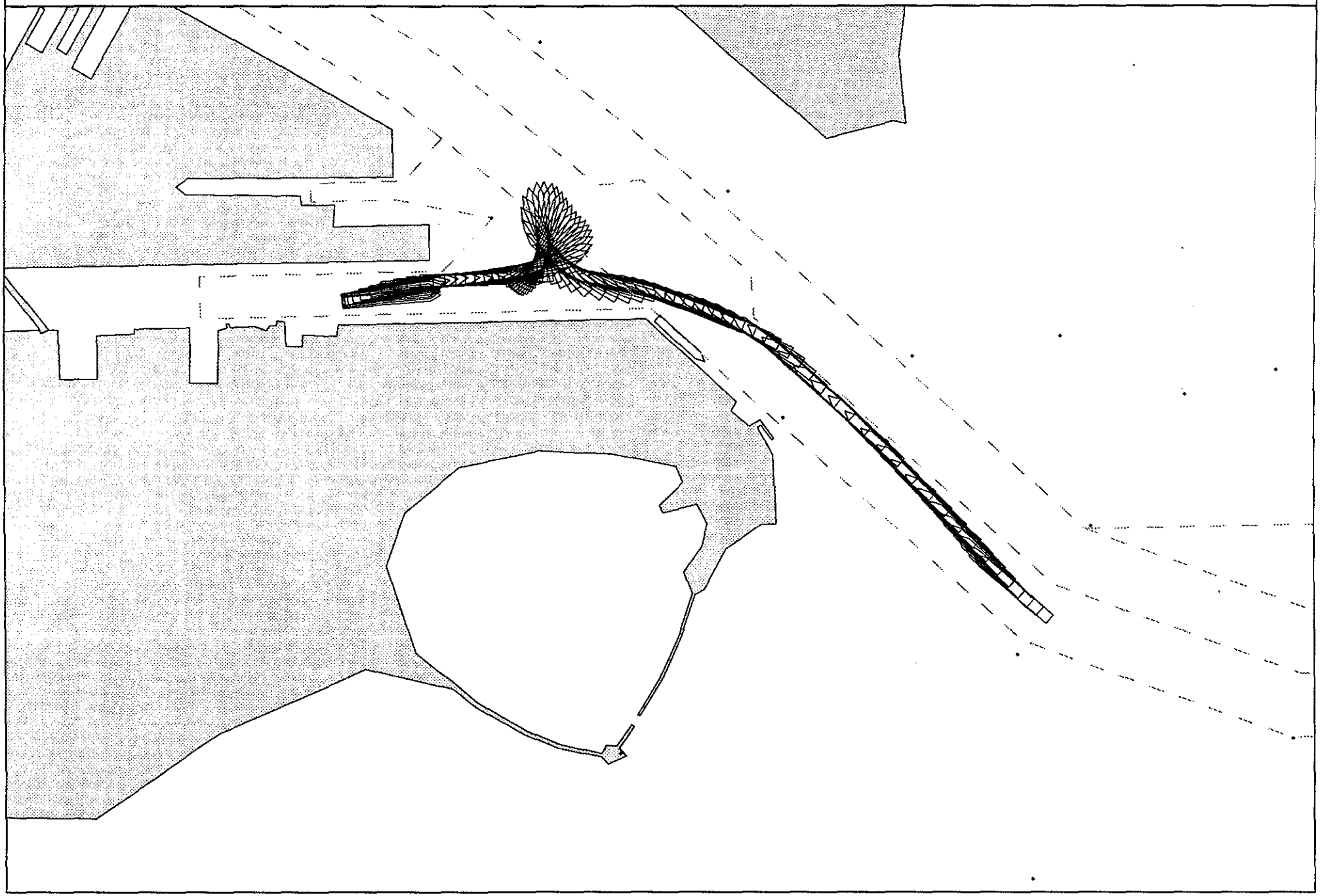
FILE ID :54243100 DATABASE : BOSTONP1.DB TRACK LINE :

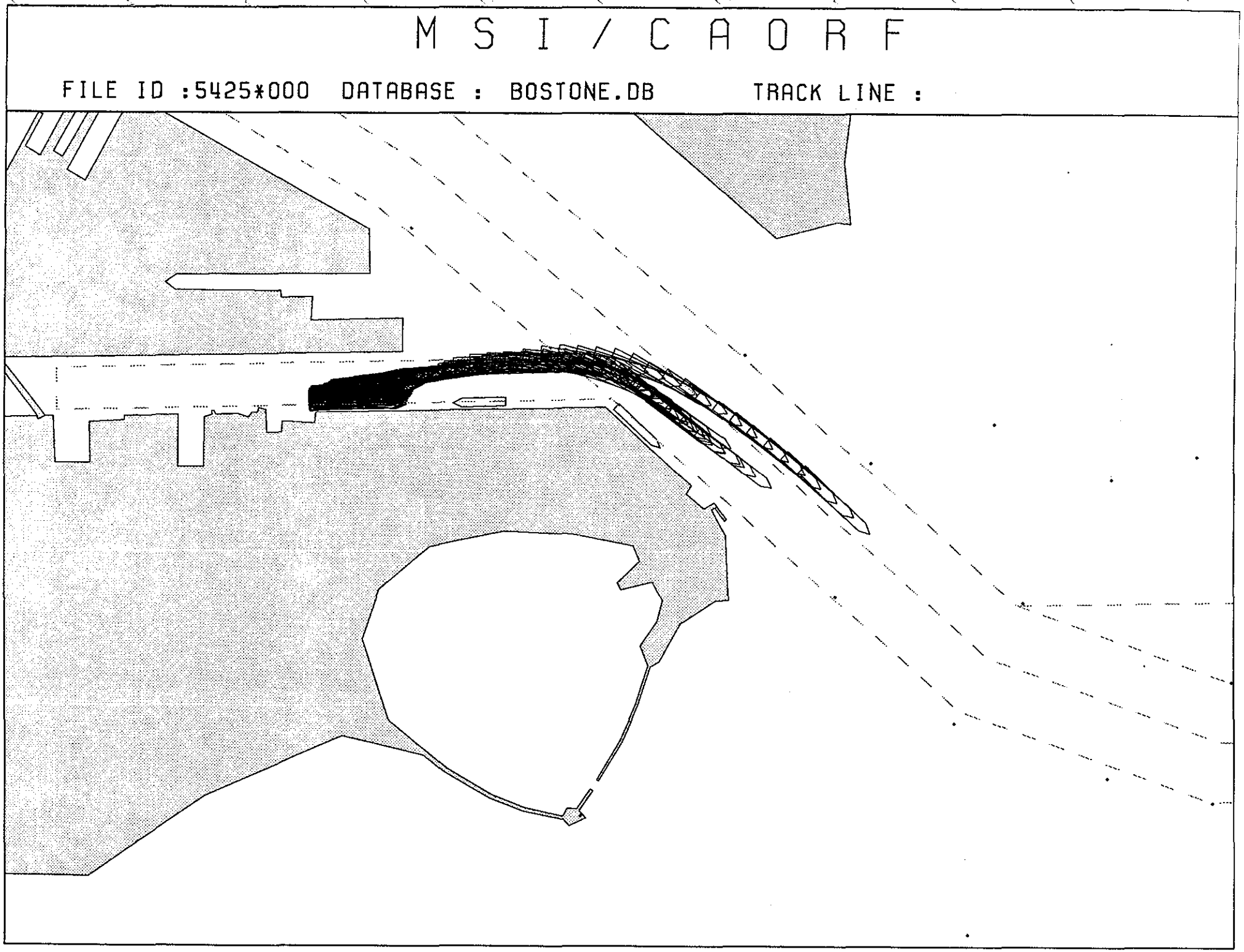



M S I / C A O R F
FILE ID :54244100 DATABASE : BOSTONP1.DB TRACK LINE :

M S I / C A O R F

FILE ID :54245100 DATABASE : BOSTONP1.DB TRACK LINE :




M S I / C A O R F
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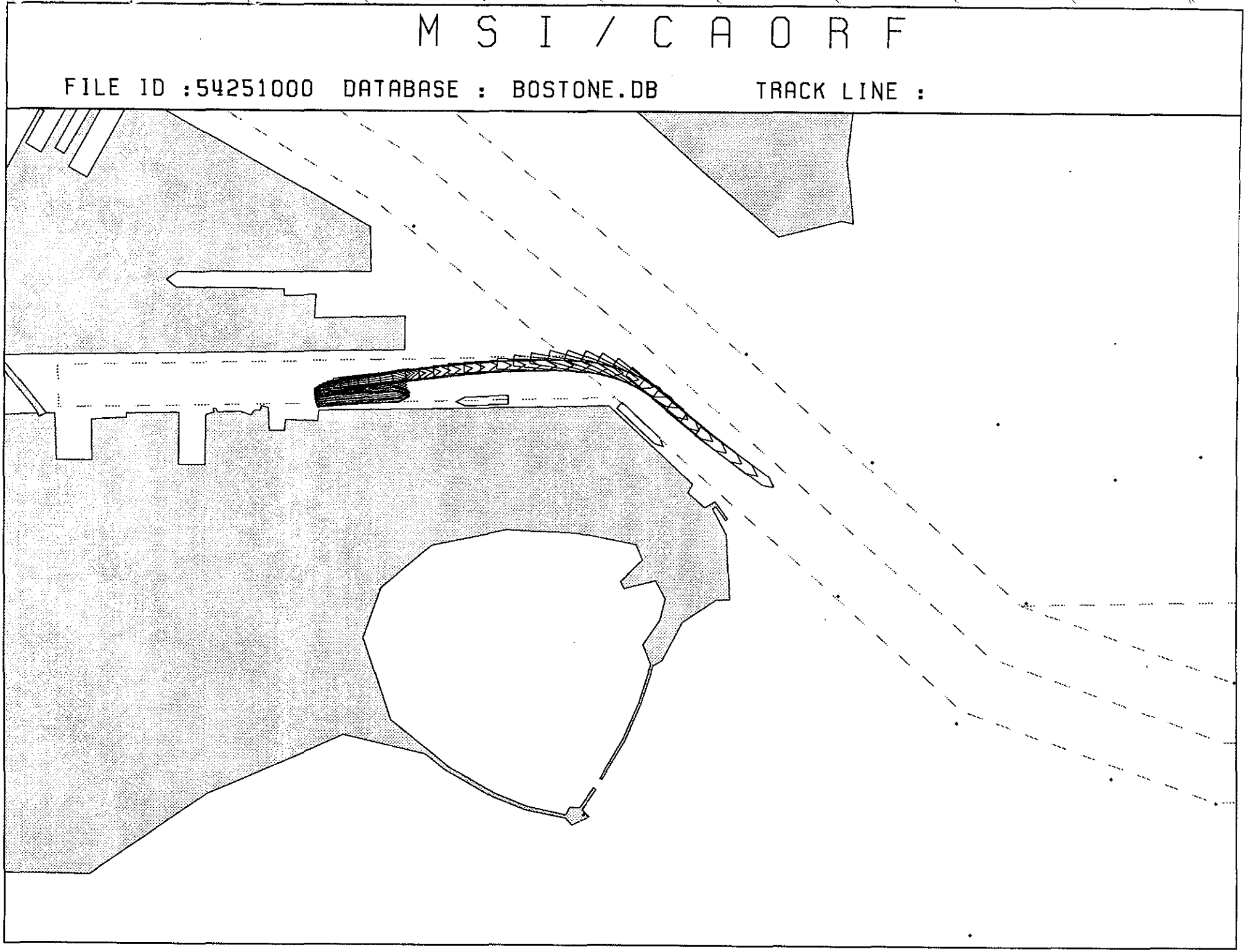
M S I / C A O R F
FILE ID :54251000 DATABASE : BOSTONE.DB TRACK LINE :

M S I / C A O R F

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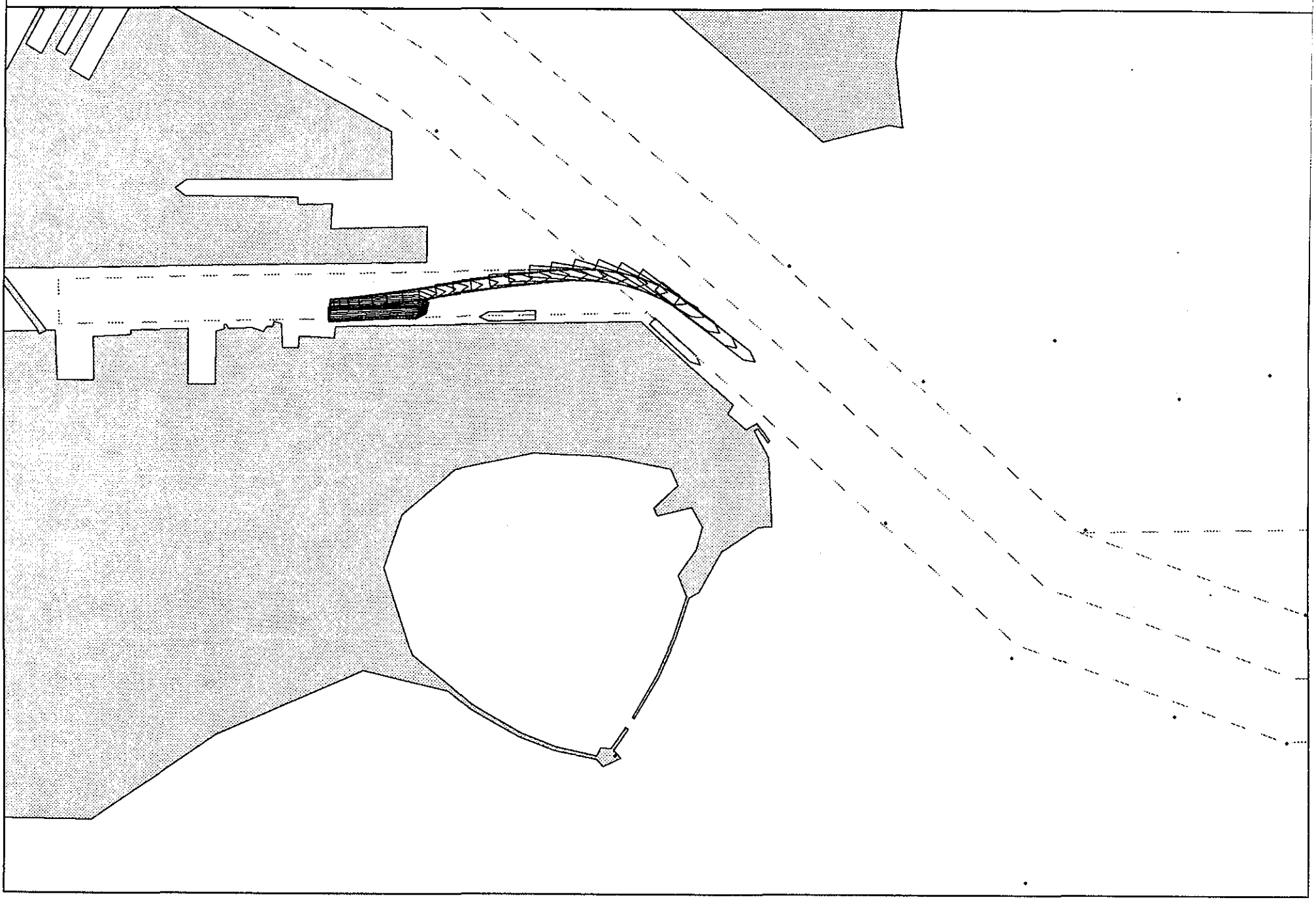

M S I / C A O R F

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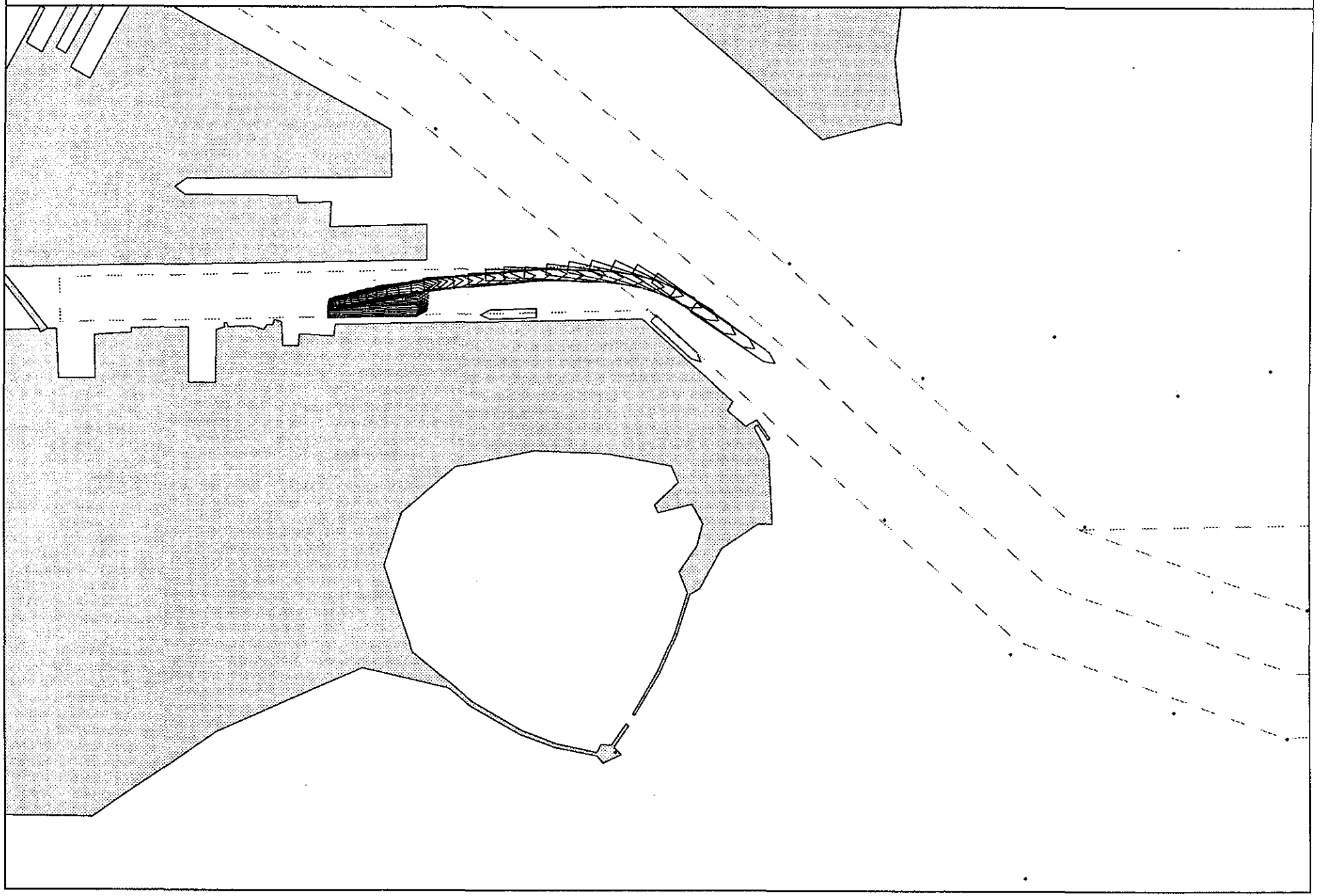
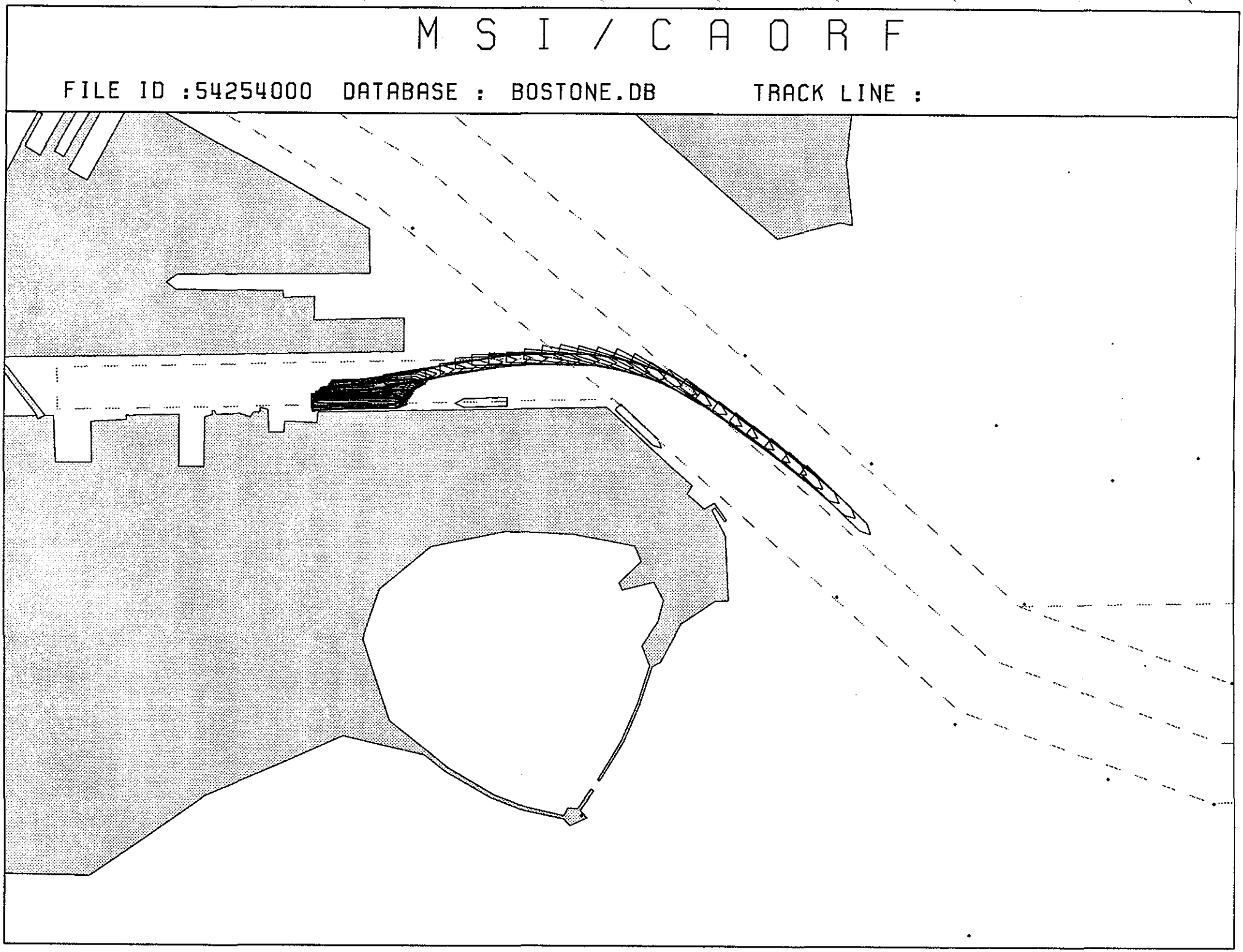
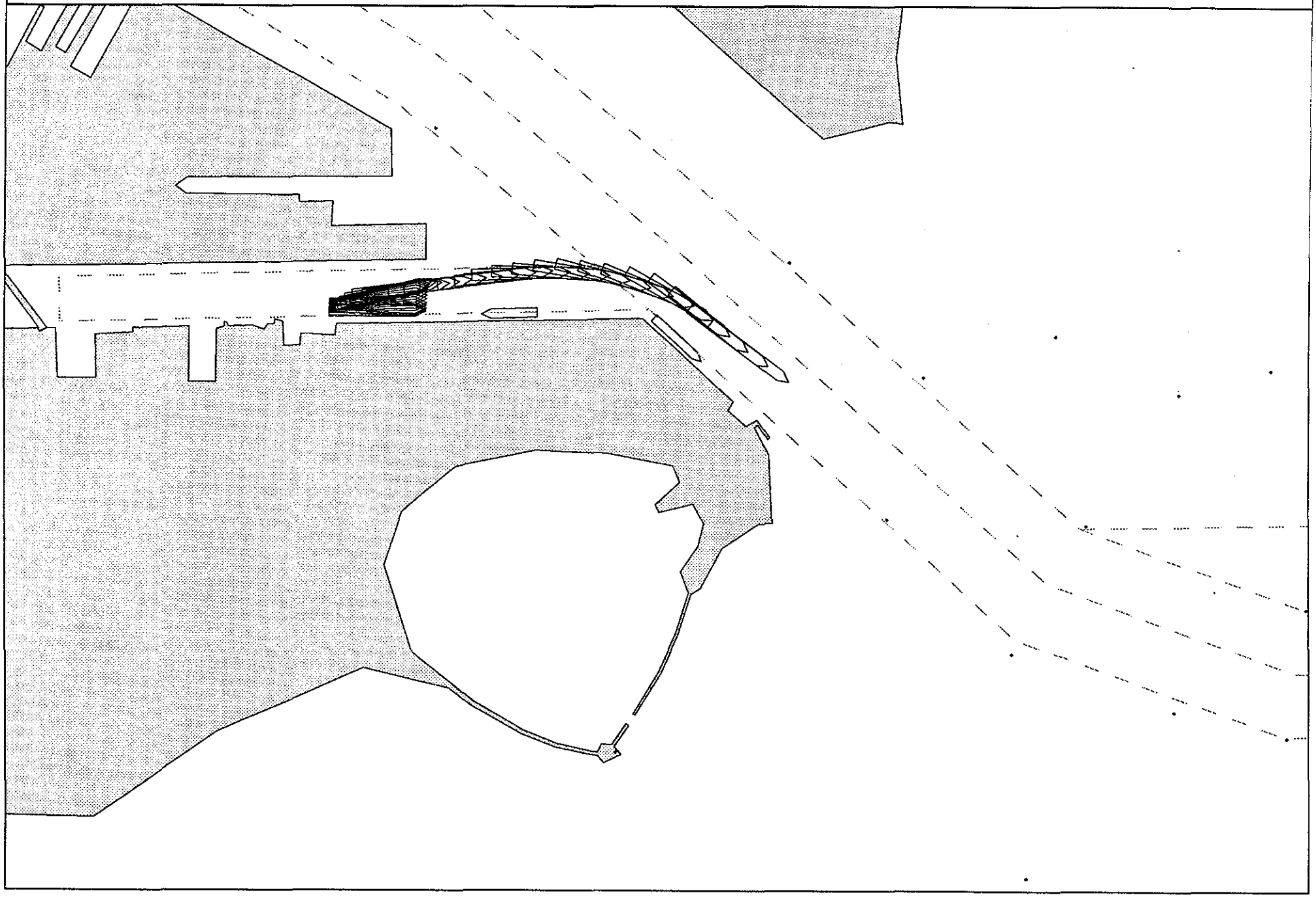
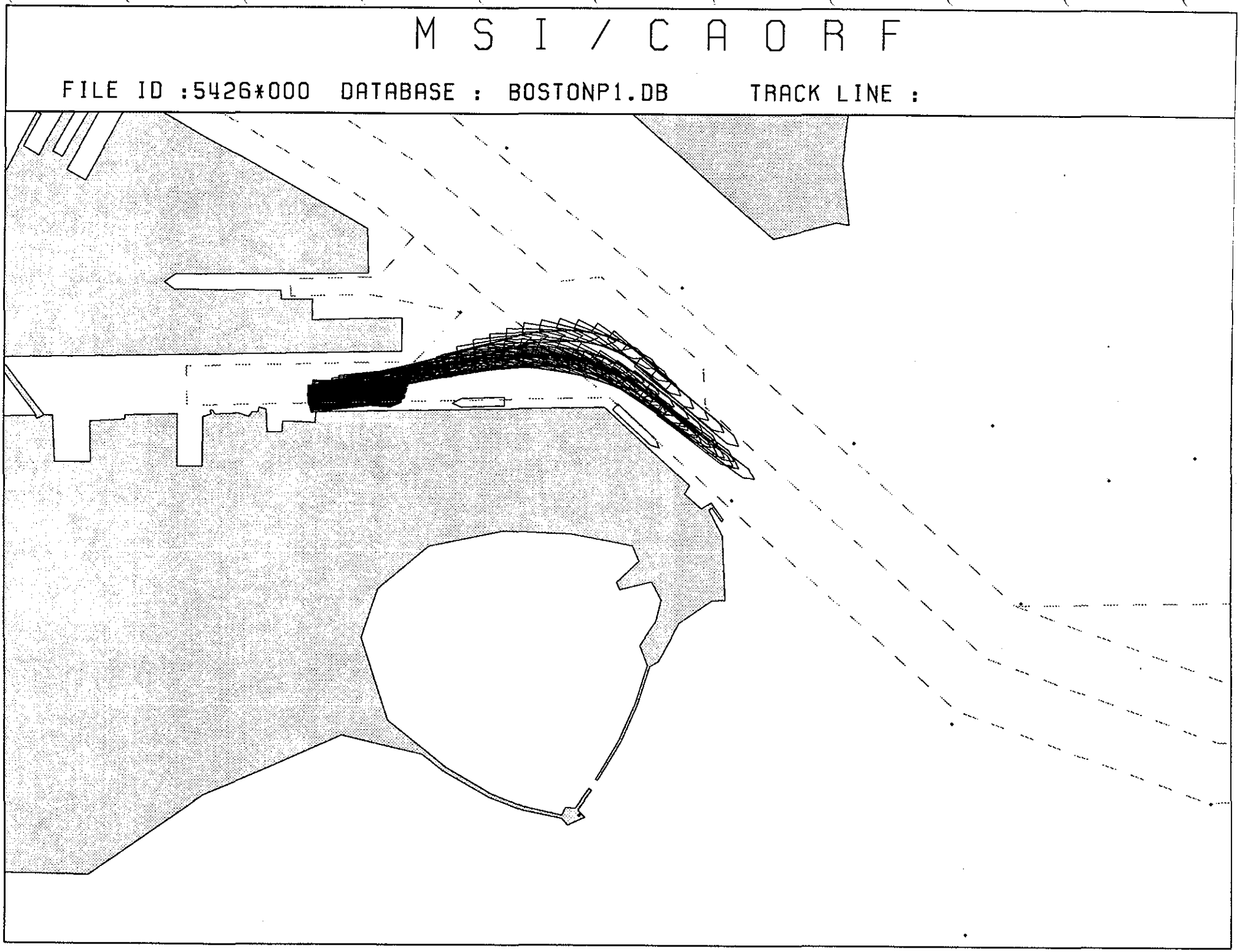


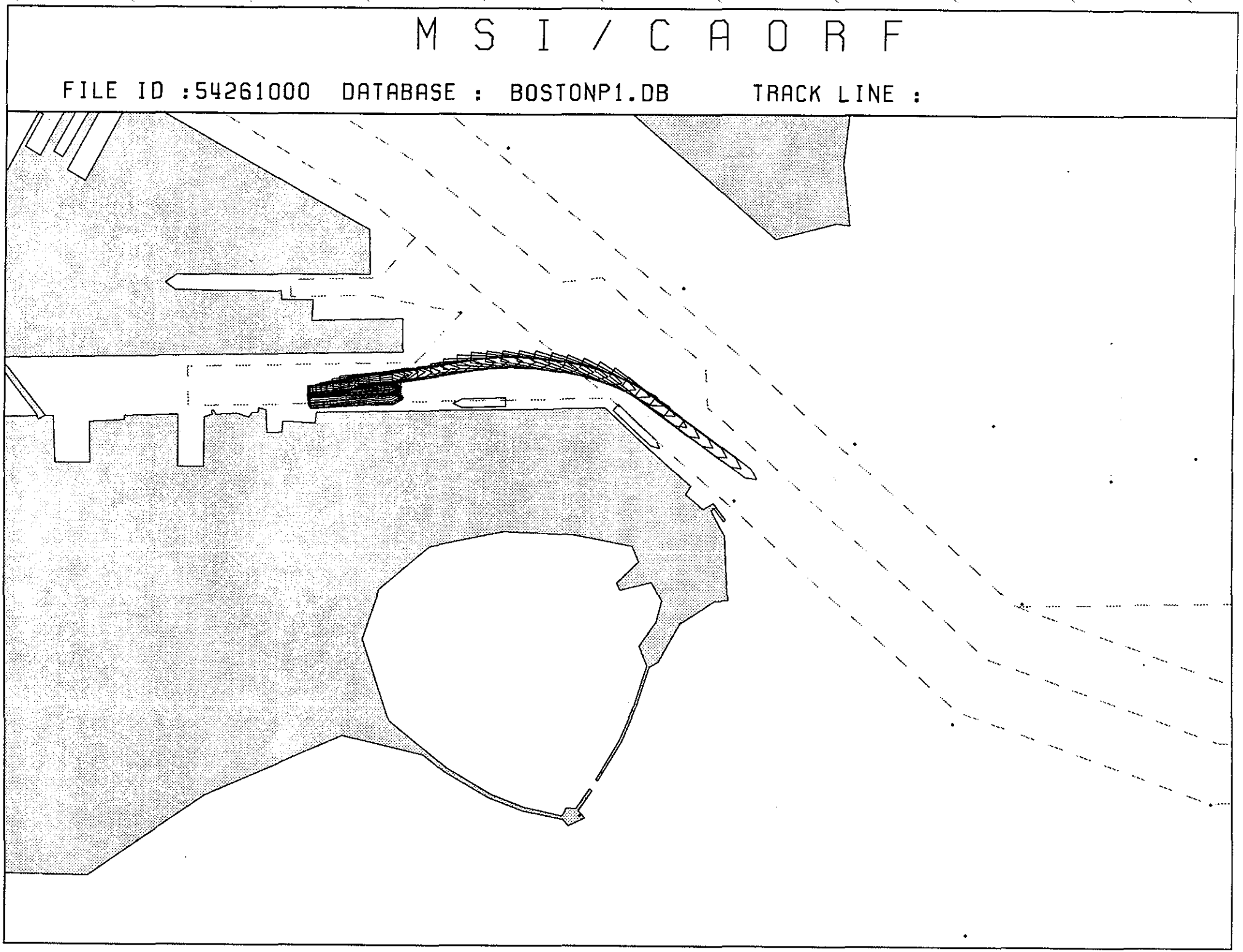

M S I / C A O R F
FILE ID :54254000 DATABASE : BOSTONE.DB TRACK LINE :

M S I / C A O R F

FILE ID :54255000 DATABASE : BOSTONE.DB TRACK LINE :

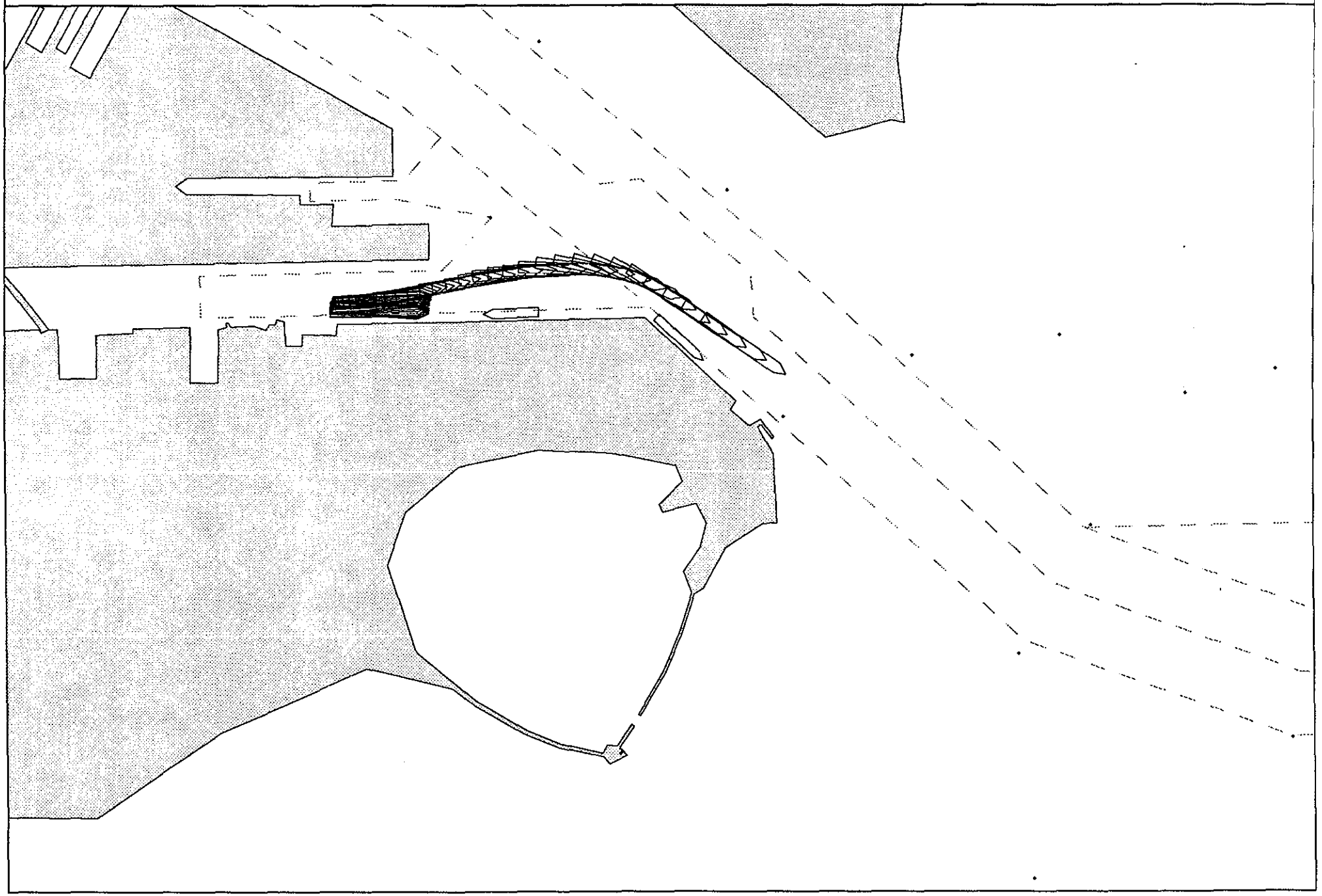



M S I / C A O R F
FILE ID :5426*000 DATABASE : BOSTONP1.DB TRACK LINE :


M S I / C A O R F
FILE ID :54261000 DATABASE : BOSTONP1.DB TRACK LINE :

M S I / C A O R F

FILE ID :54262000 DATABASE : BOSTONP1.DB TRACK LINE :



M S I / C A O R F

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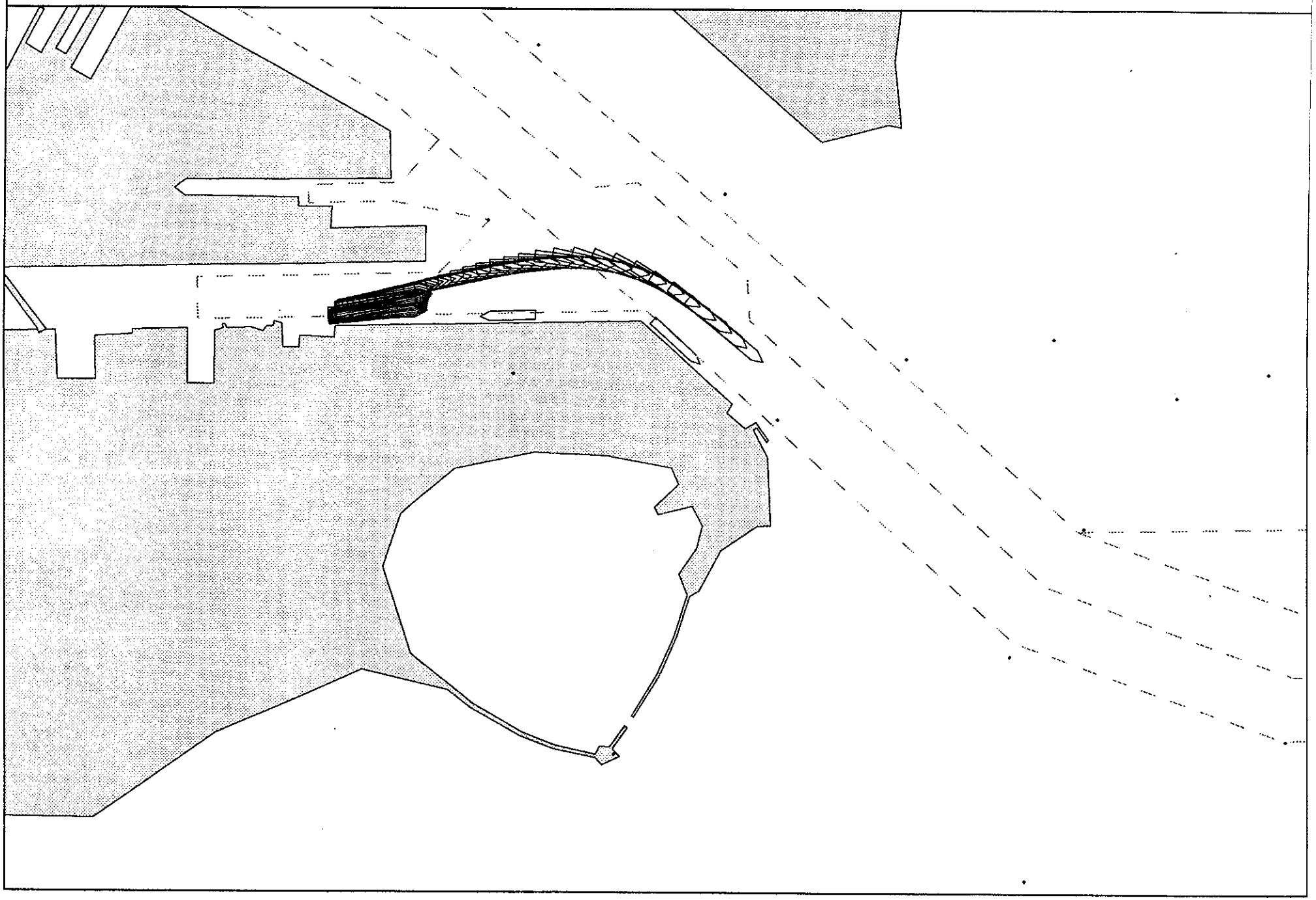

M S I / C A O R F

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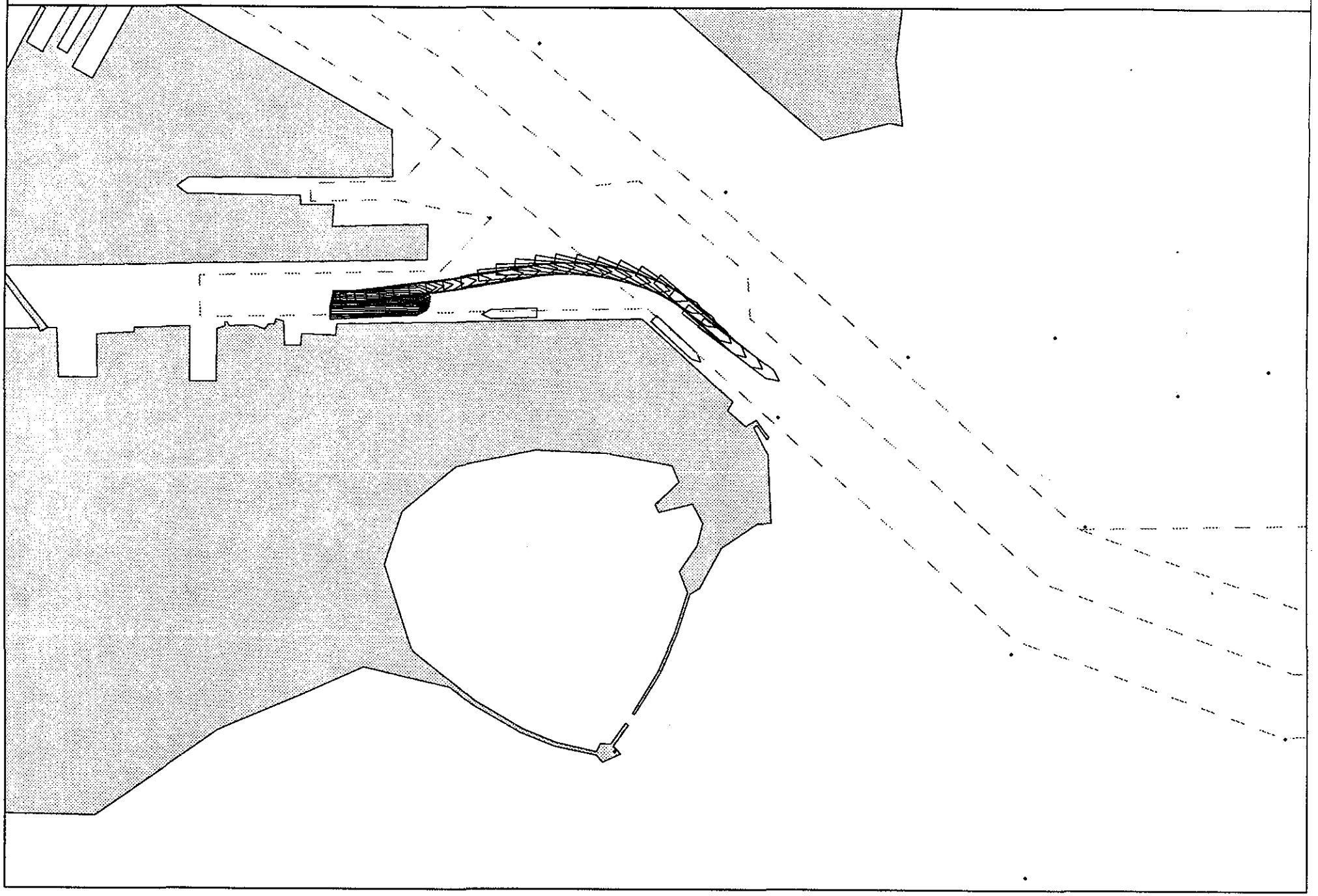
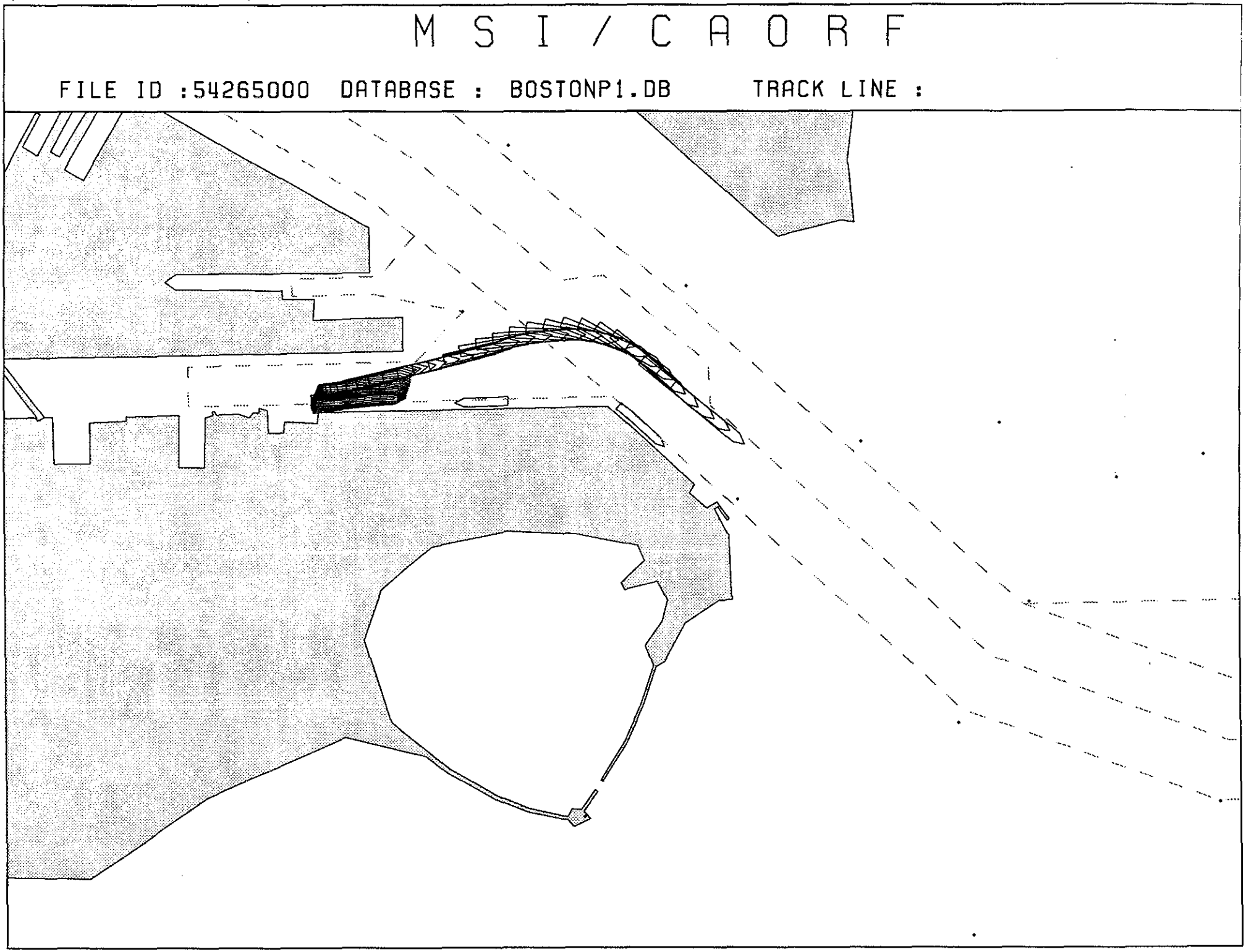
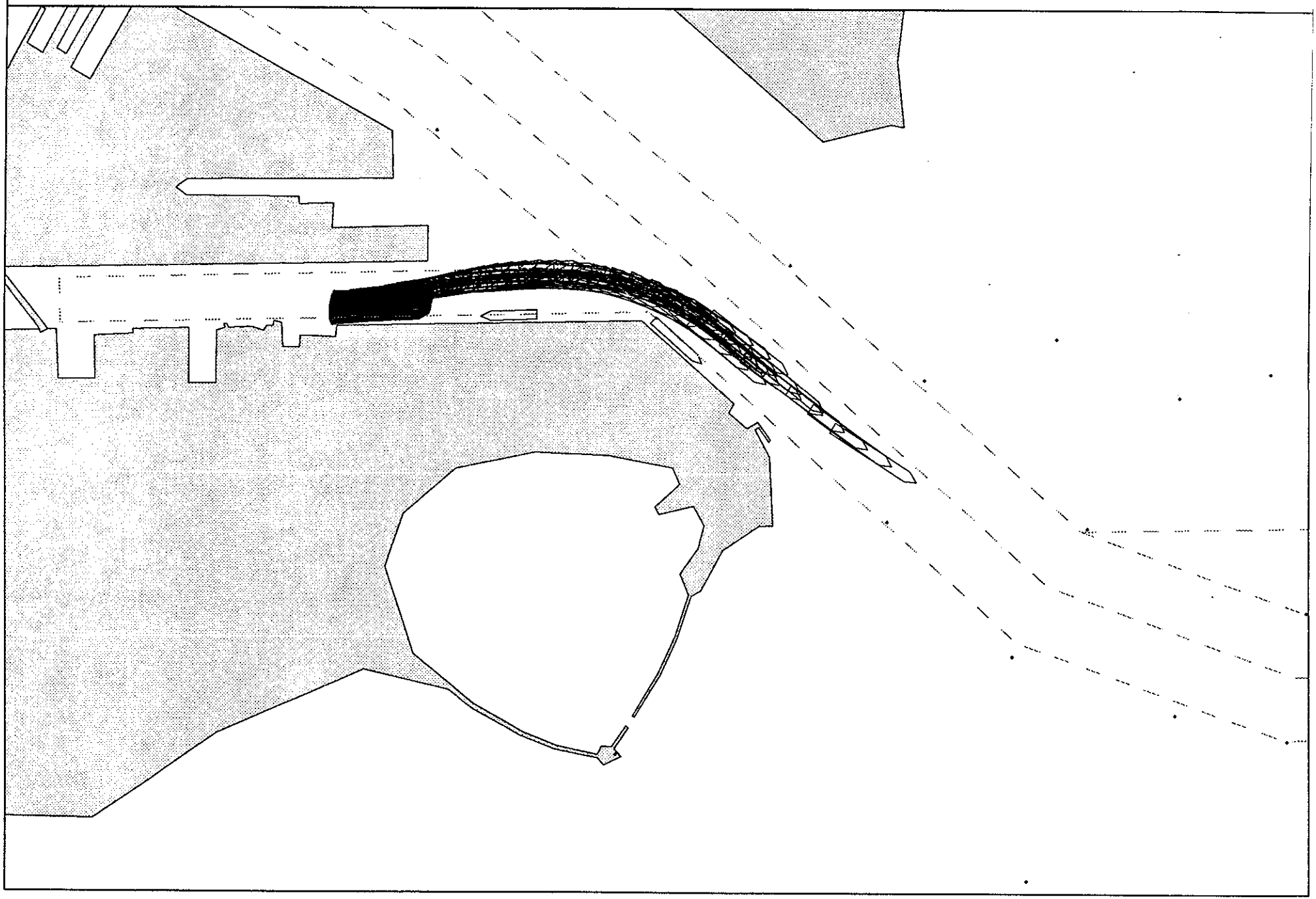



M S I / C A O R F
FILE ID :54265000 DATABASE : BOSTONP1.DB TRACK LINE :

M S I / C A O R F

FILE ID :5427*000 DATABASE : BOSTONE.DB TRACK LINE :



M S I / C A O R F

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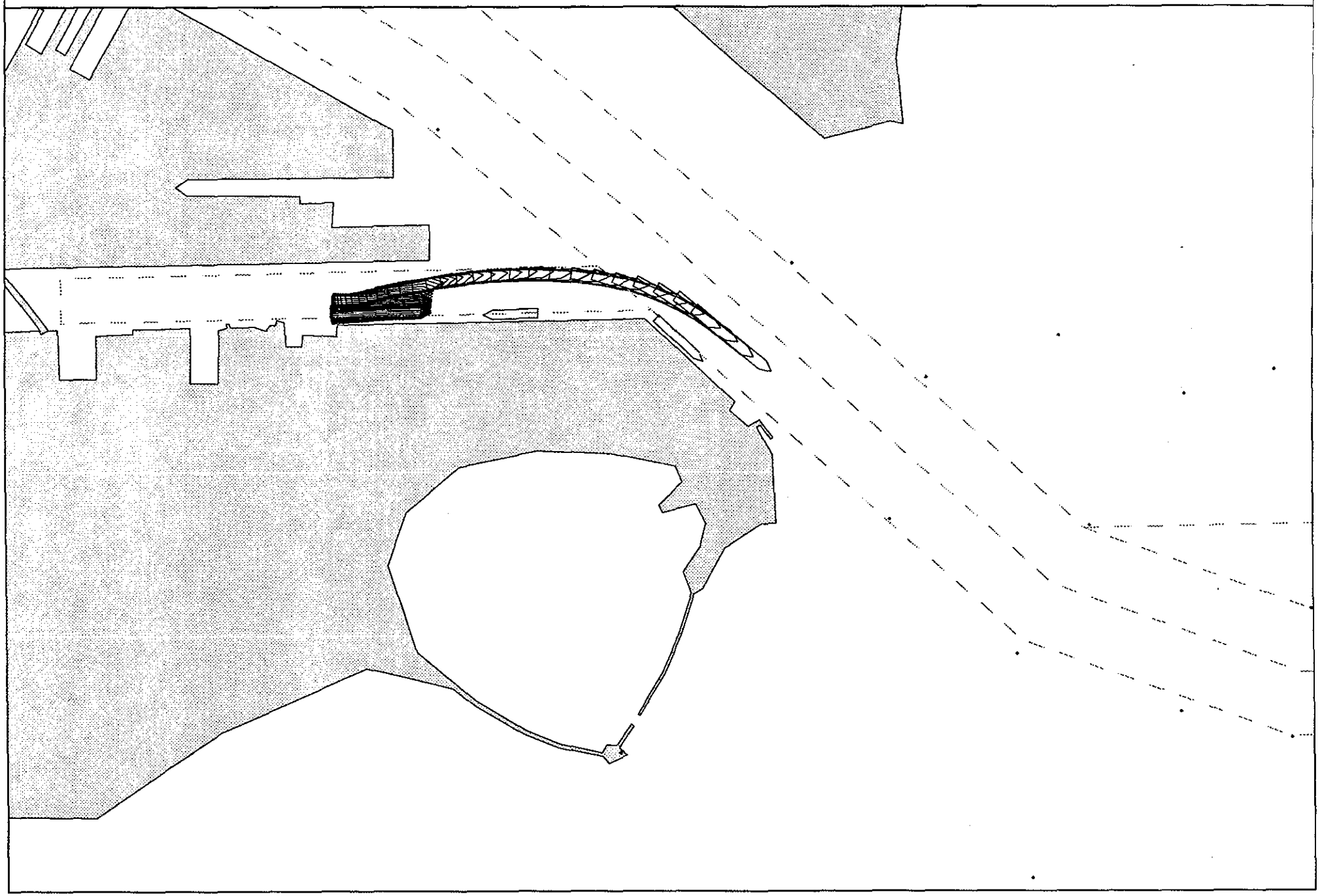

M S I / C A O R F

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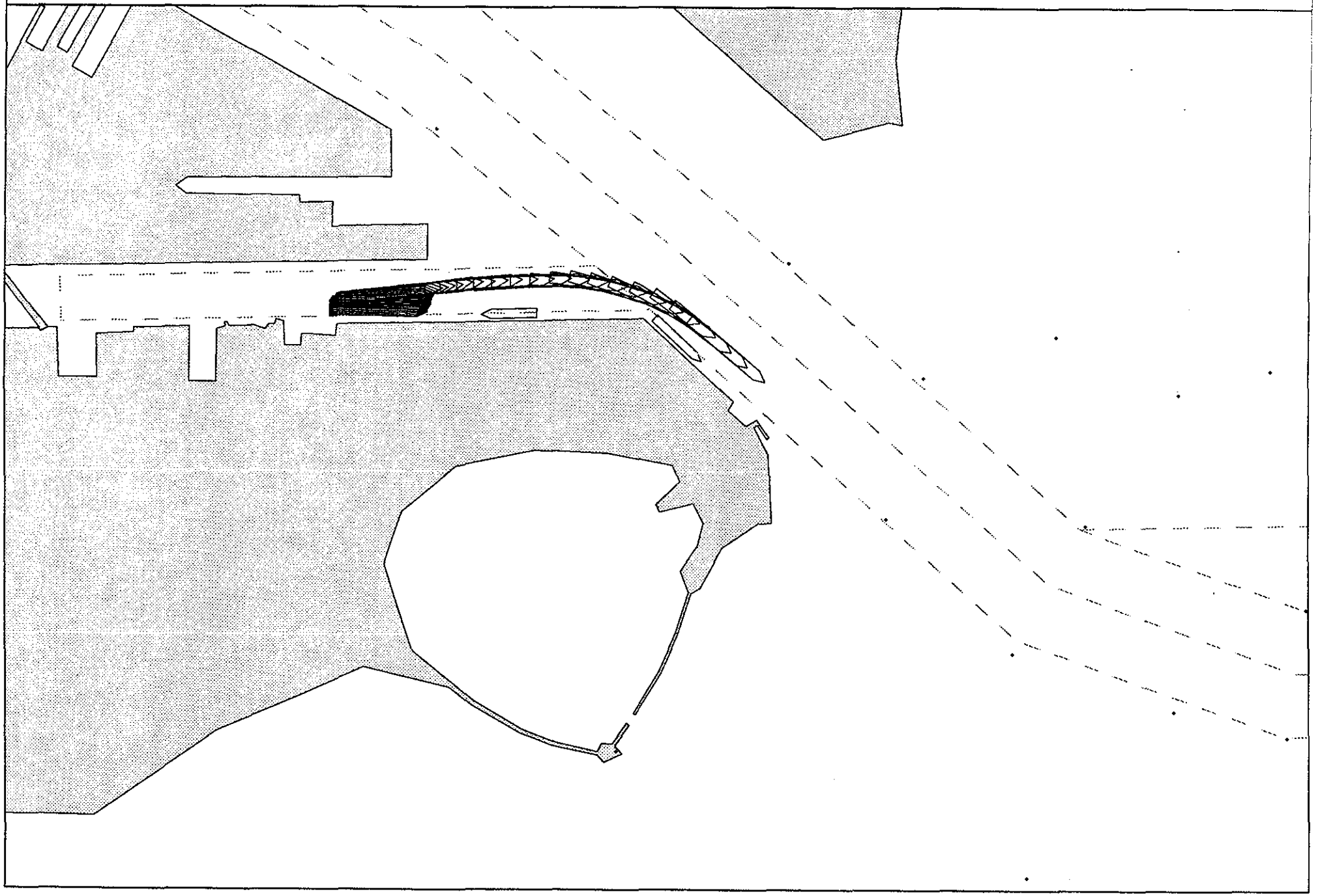

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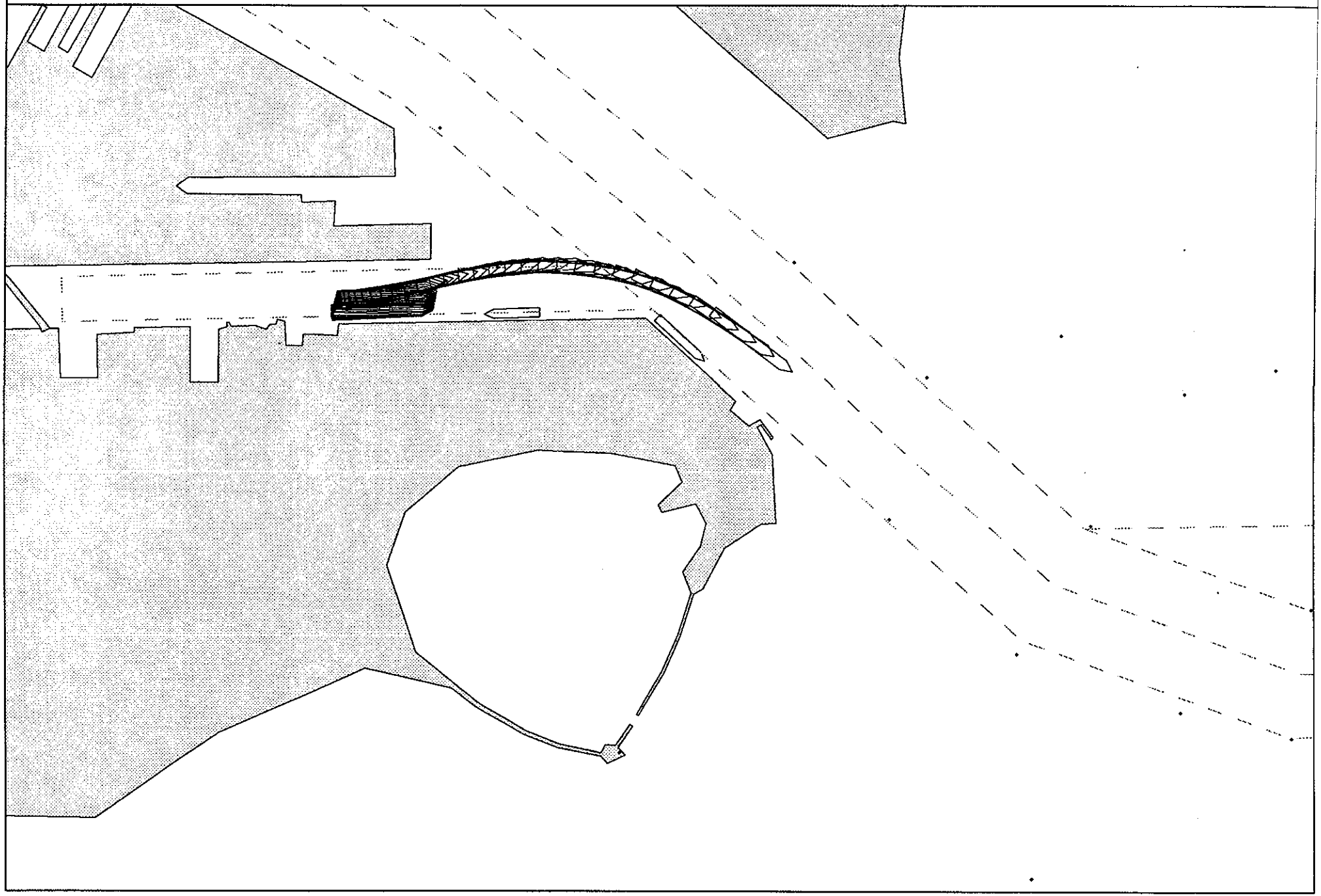

M S I / C A O R F

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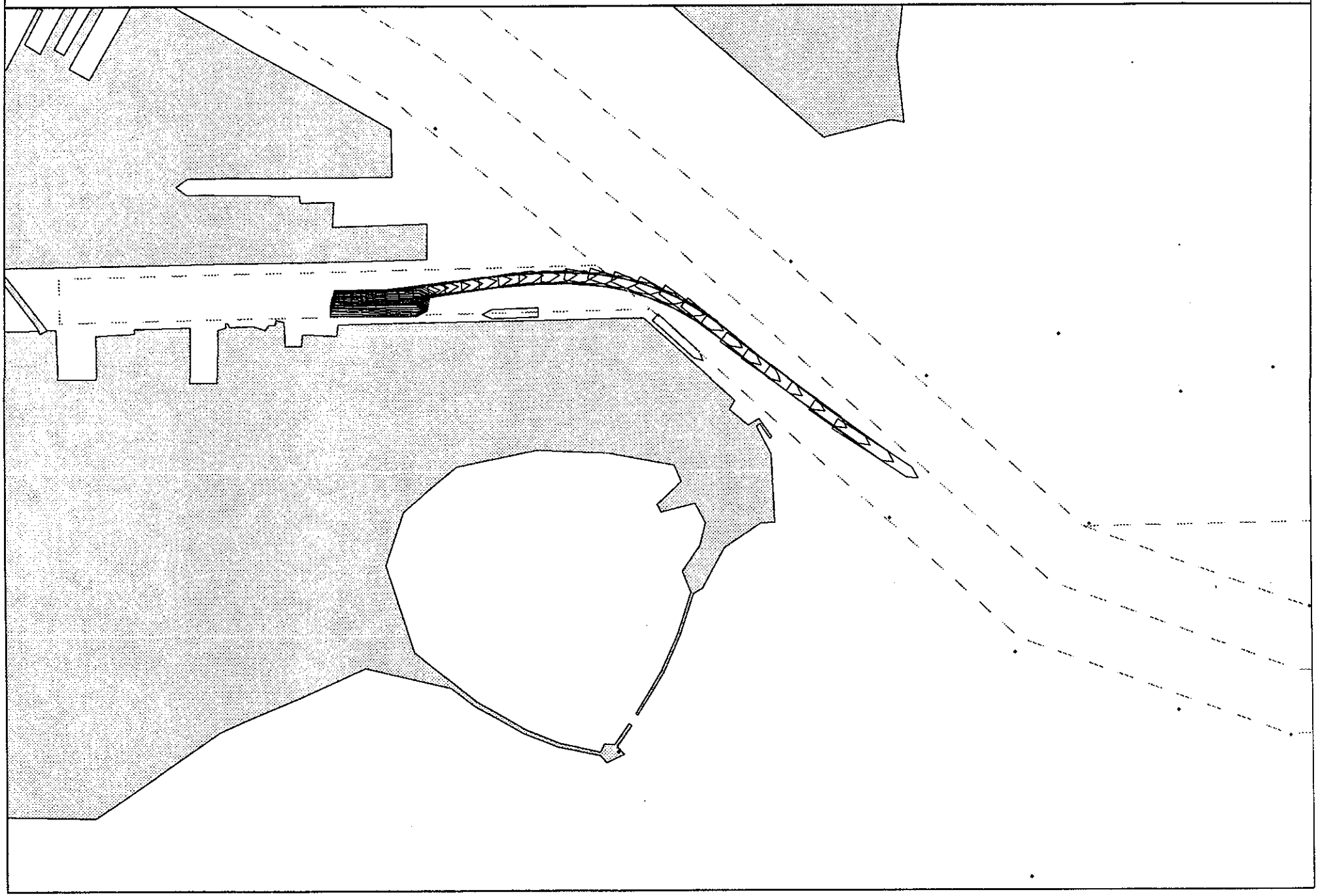

M S I / C A O R F

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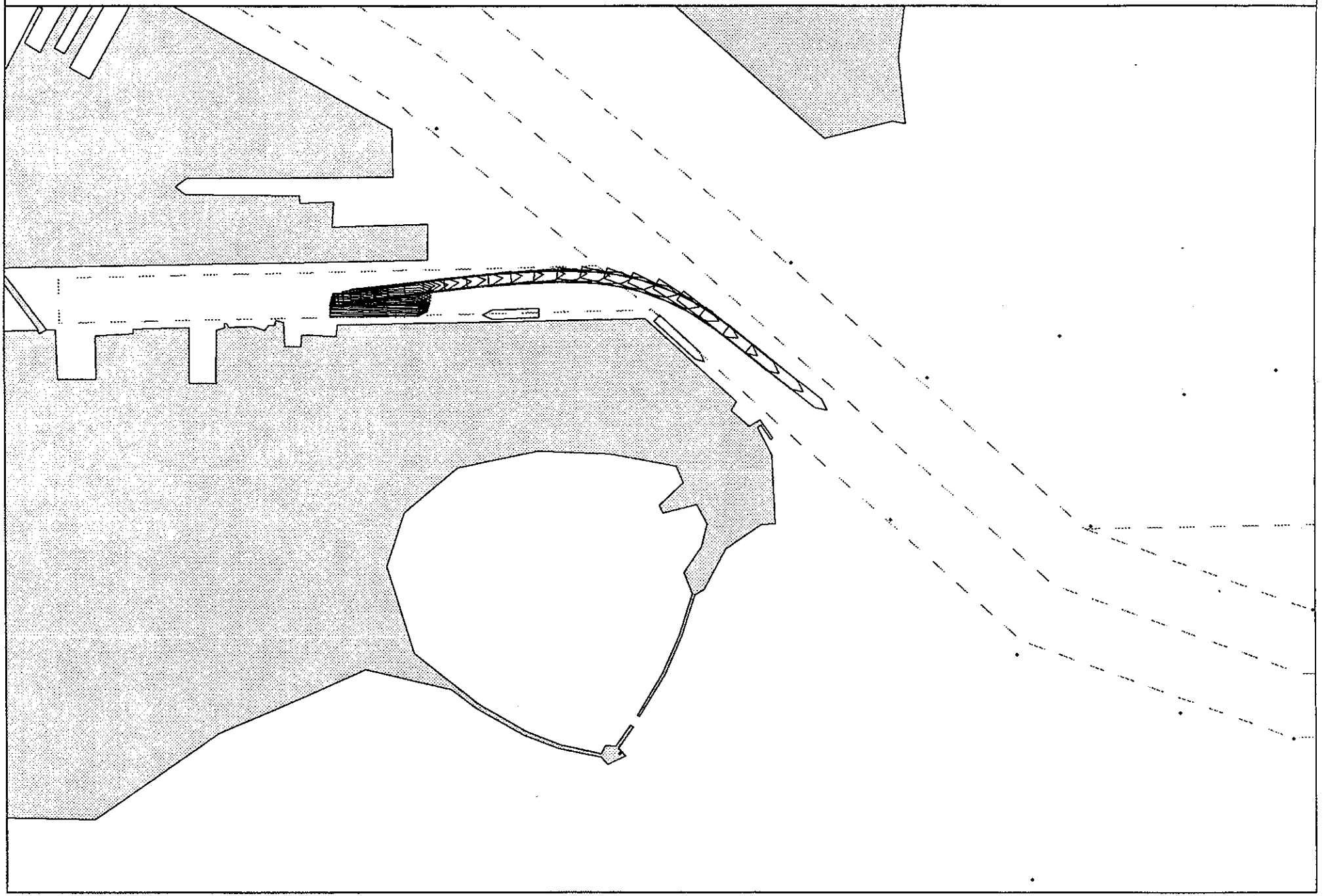

M S I / C A O R F

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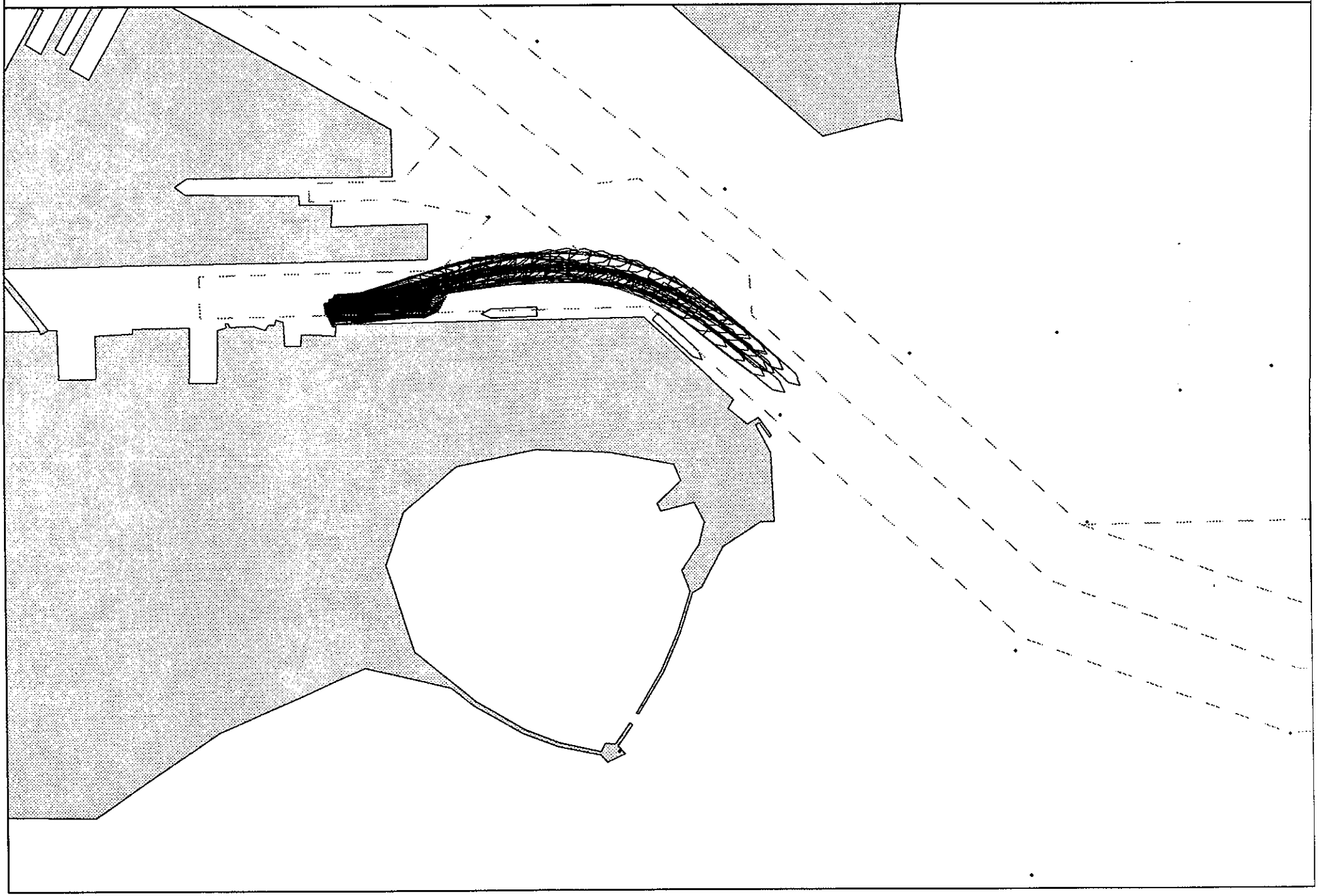

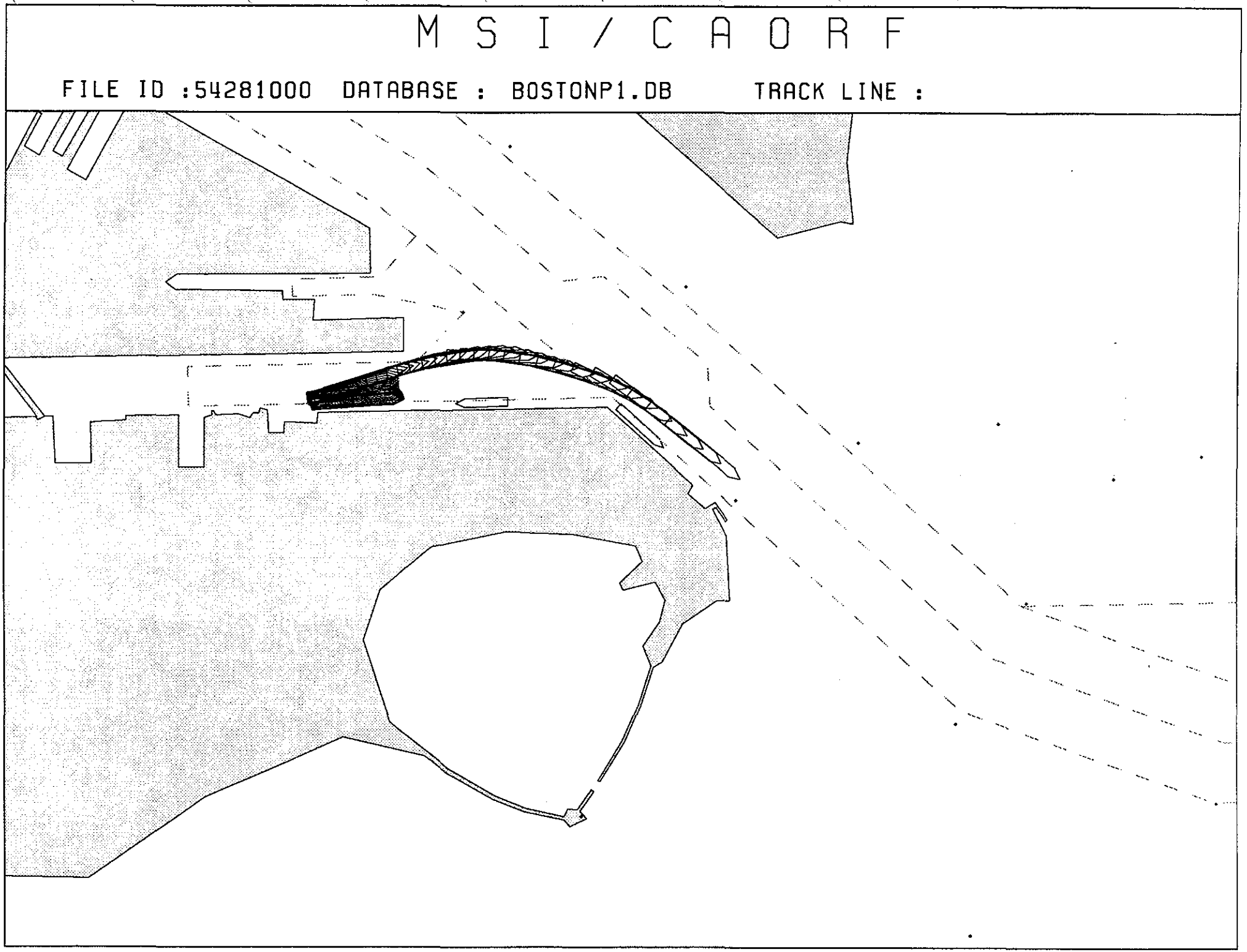
M S I / C A O R F
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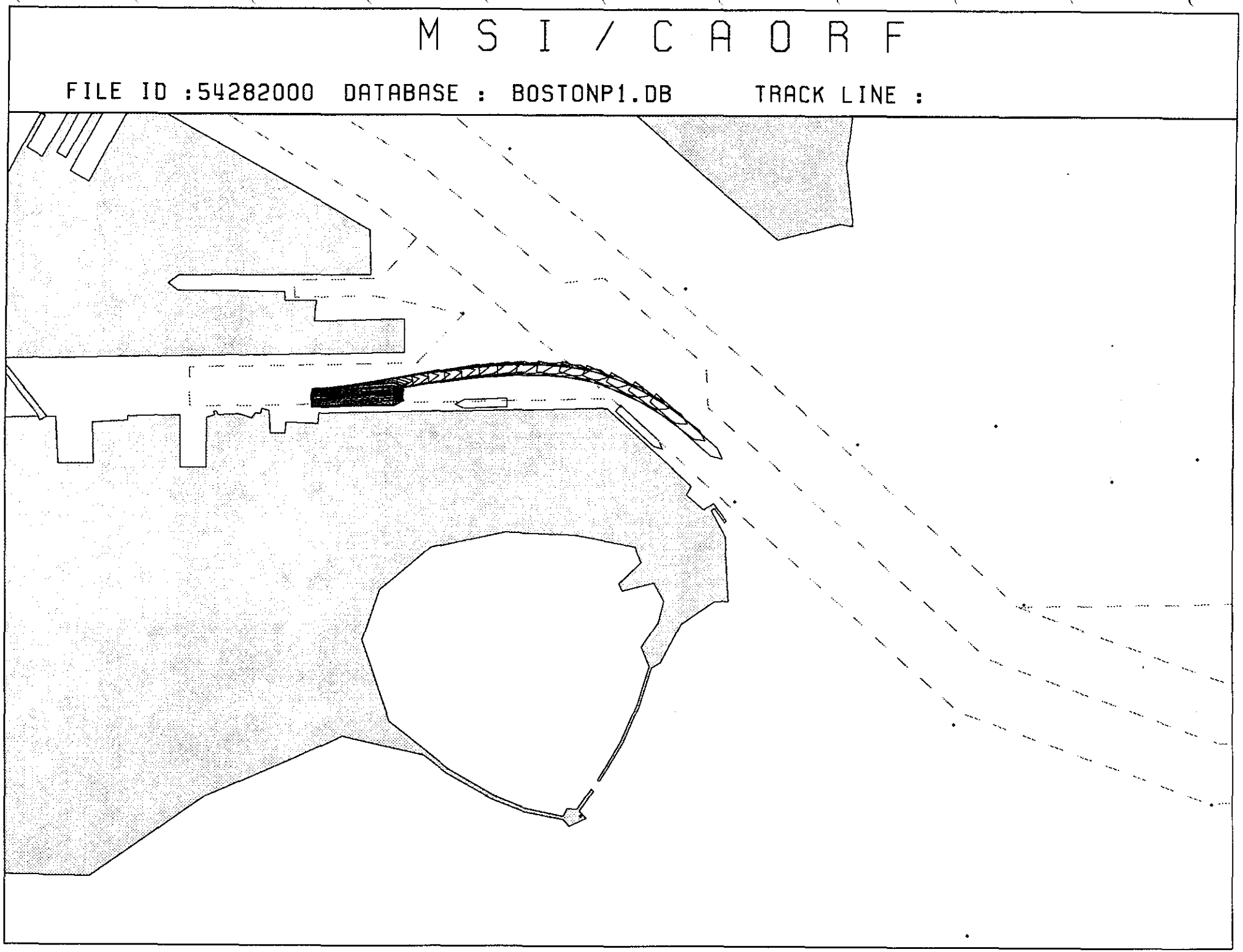
M S I / C A O R F
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M S I / C A O R F

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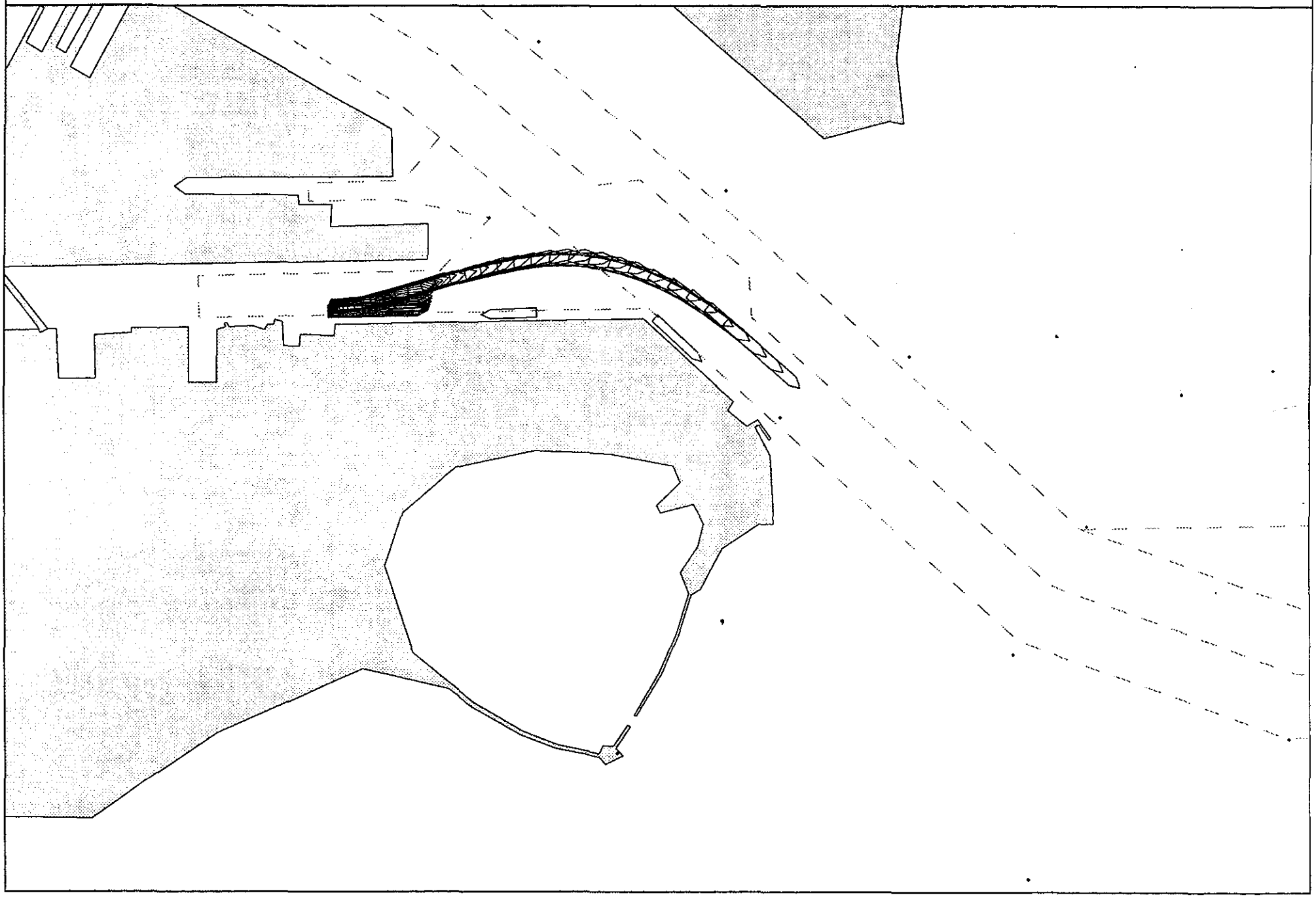

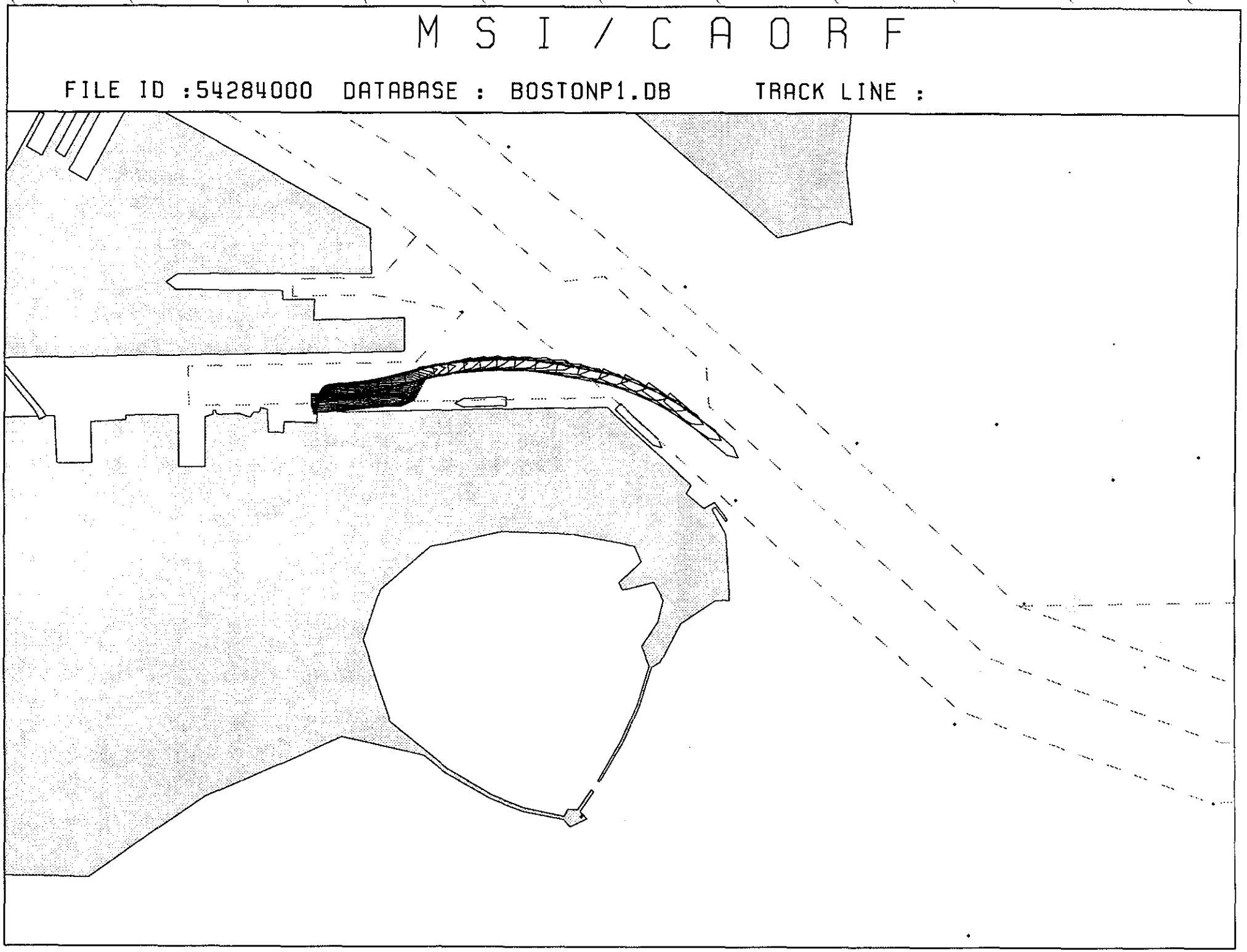
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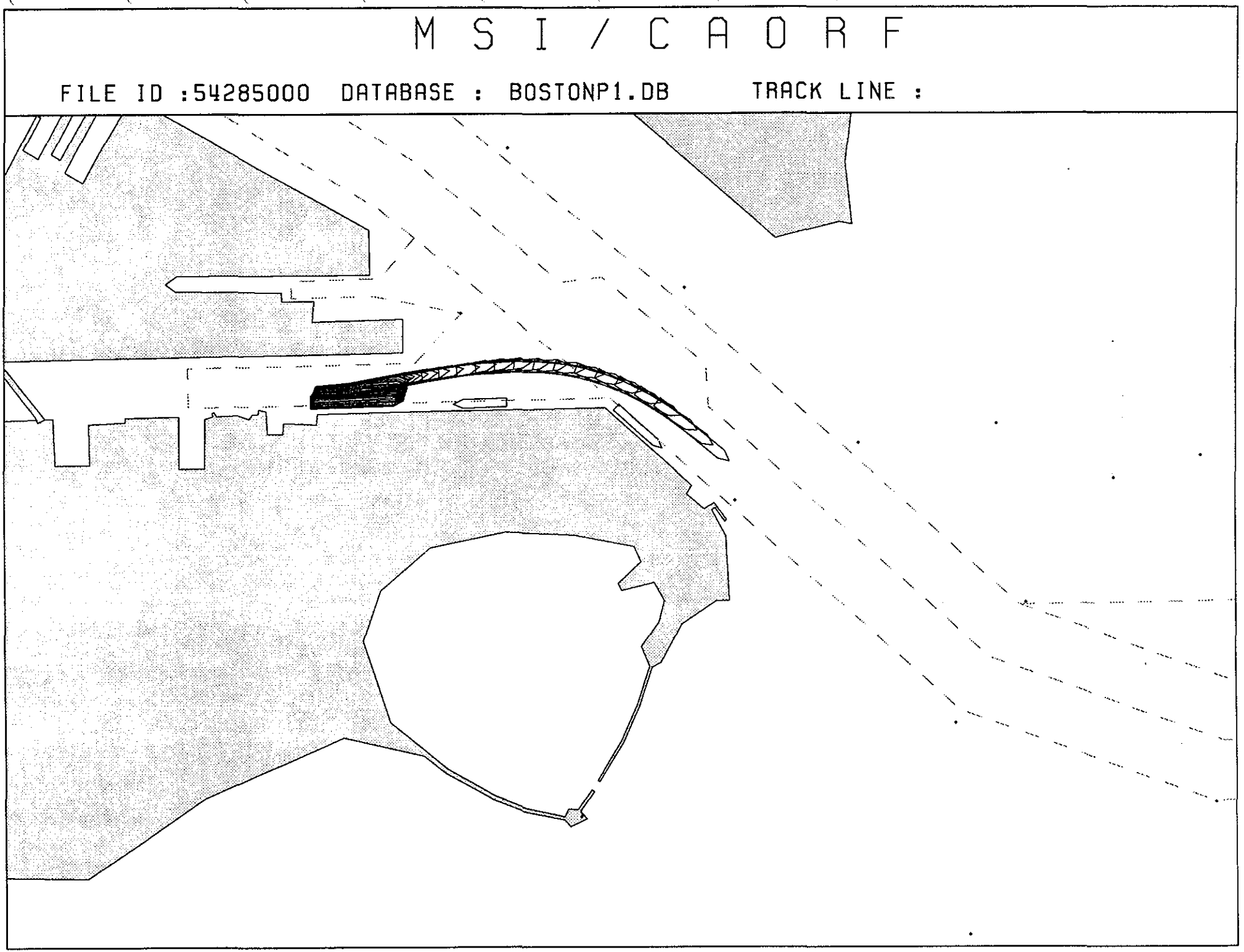
M S I / C A O R F
FILE ID :54285000 DATABASE : BOSTONP1.DB TRACK LINE :

APPENDIX B

Ship Reserve Control Plots

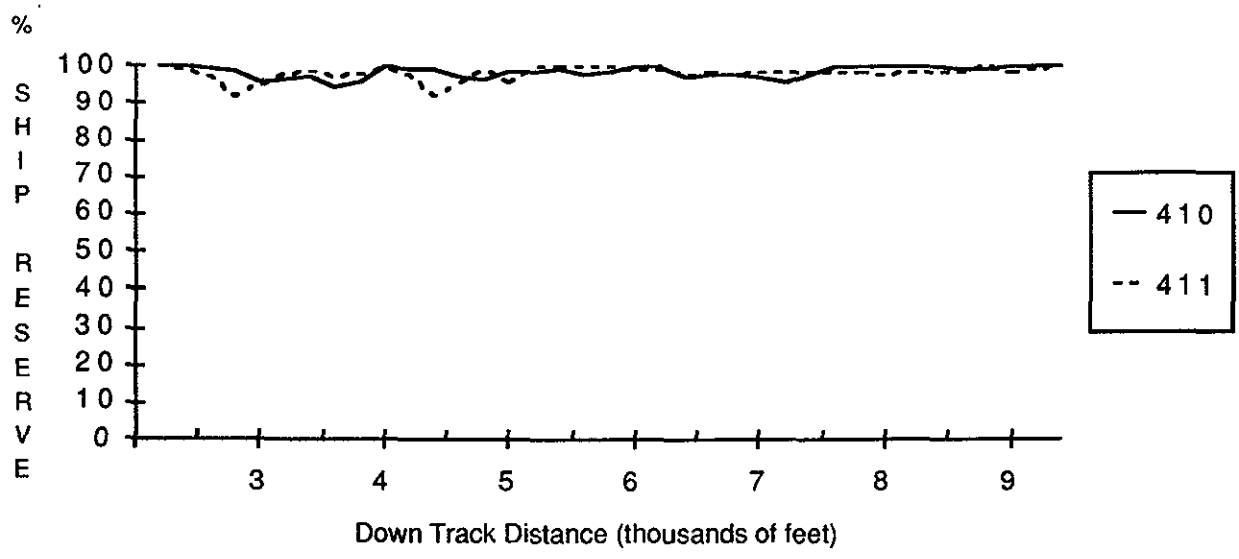

FIGURE B-1 Ship Reserve Control - Scenarios 410/411 (mean value, all pilots)

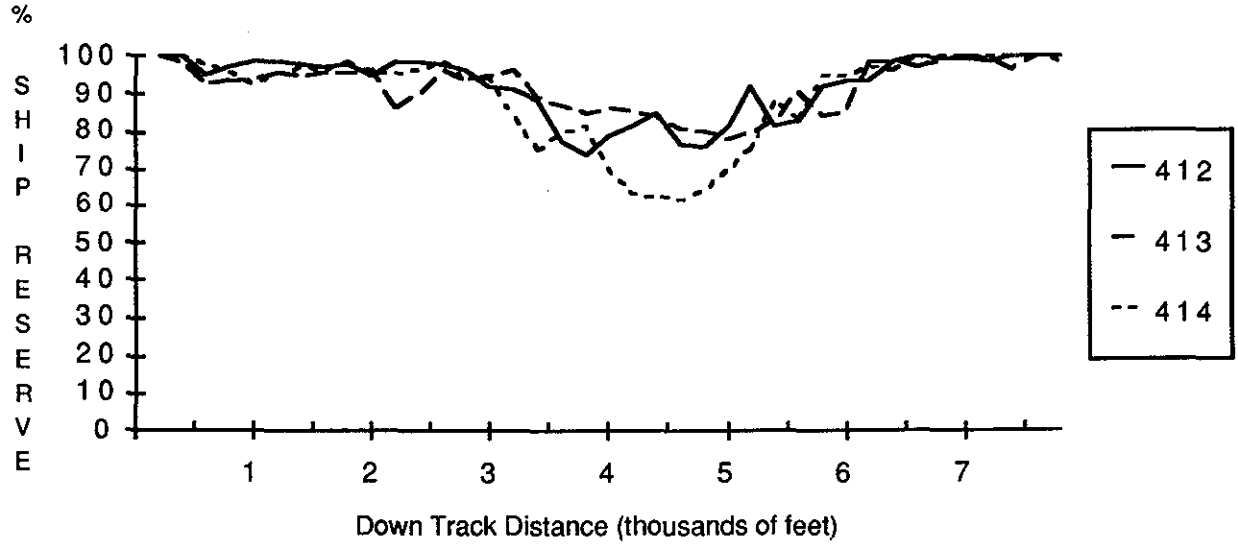

FIGURE B-2 Ship Reserve Control - Scenarios 412/413/414 (mean value, all pilots)

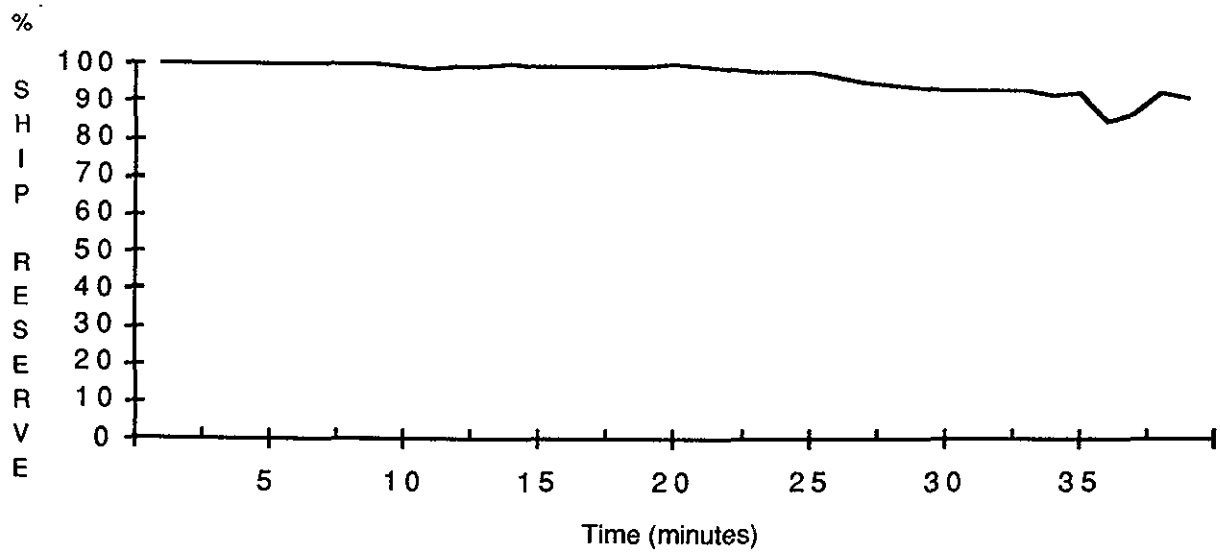

FIGURE B-3 Ship Reserve Control - Scenario 416 (mean value, all pilots)

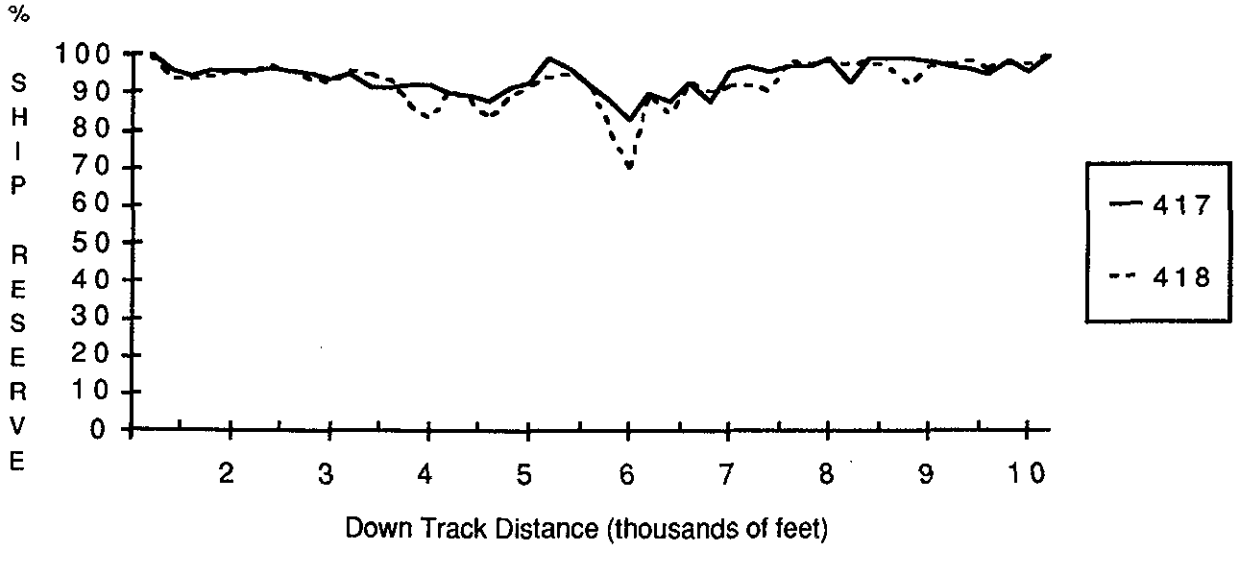

FIGURE B-4 Ship Reserve Control - Scenarios 417/418 (mean value, all pilots)

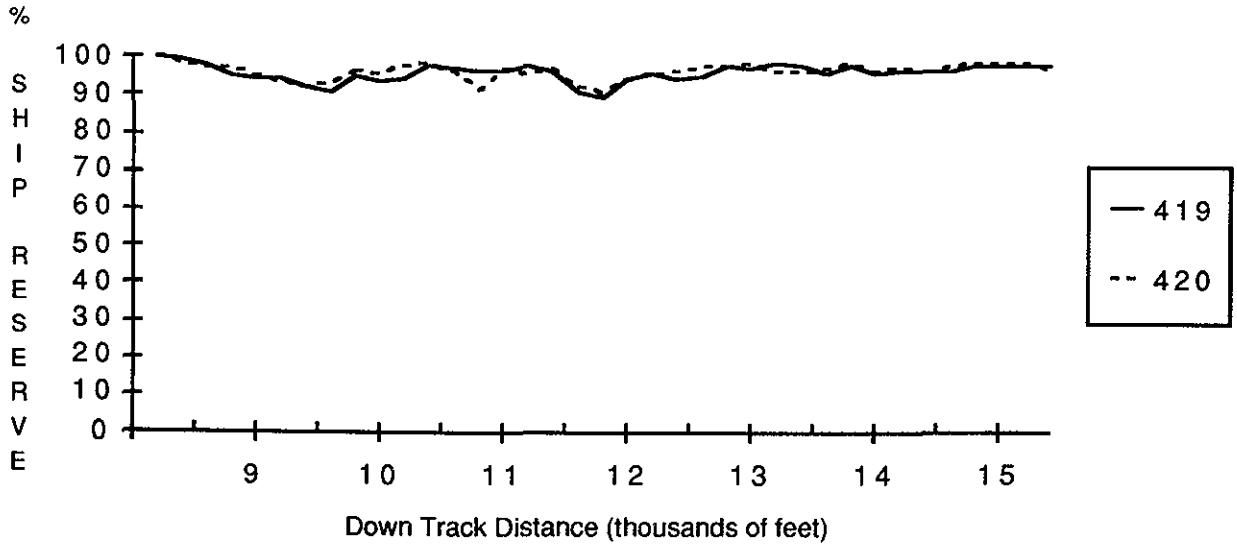

FIGURE B-5 Ship Reserve Control - Scenarios 419/420 (mean value, all pilots)

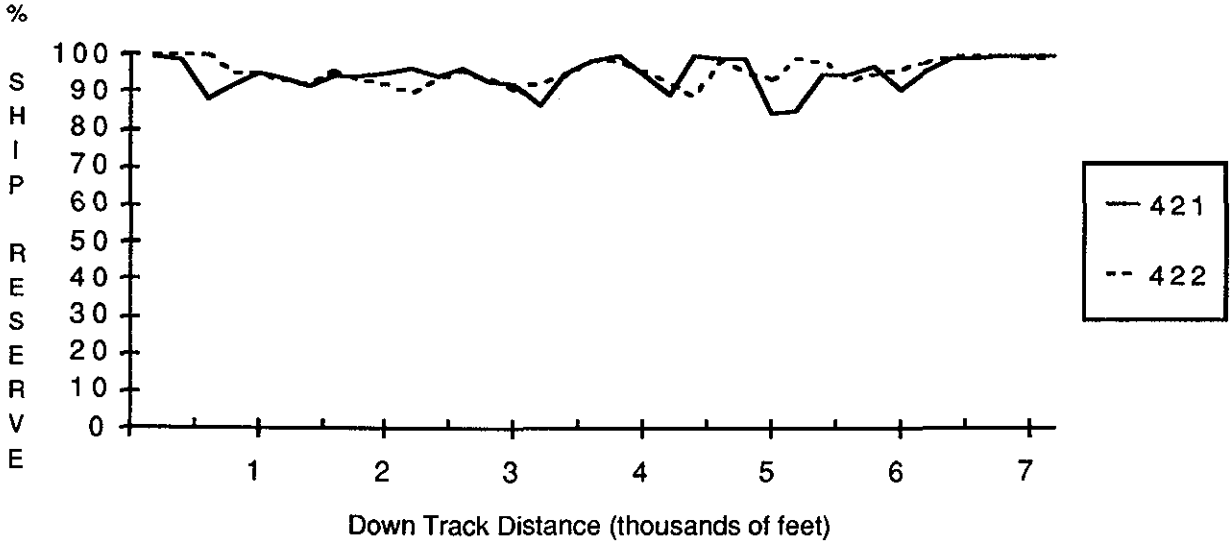

FIGURE B-6 Ship Reserve Control - Scenarios 421/422 (mean value, all pilots)

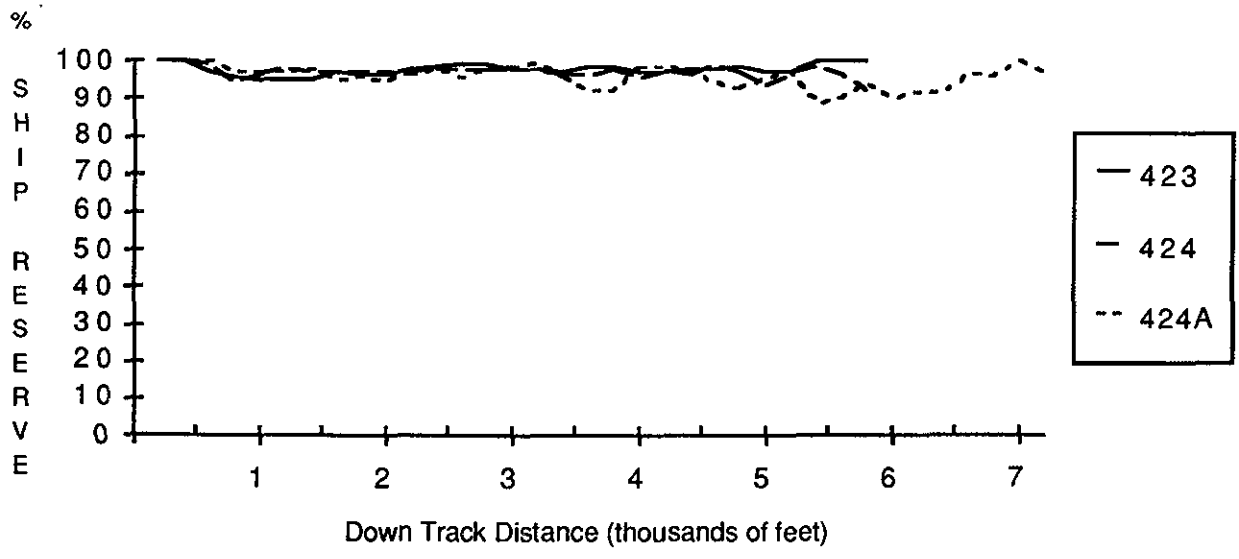

FIGURE B-7 Ship Reserve Control - Scenarios 423/424/424A (mean value, all pilots, except 424A - 3 pilots)

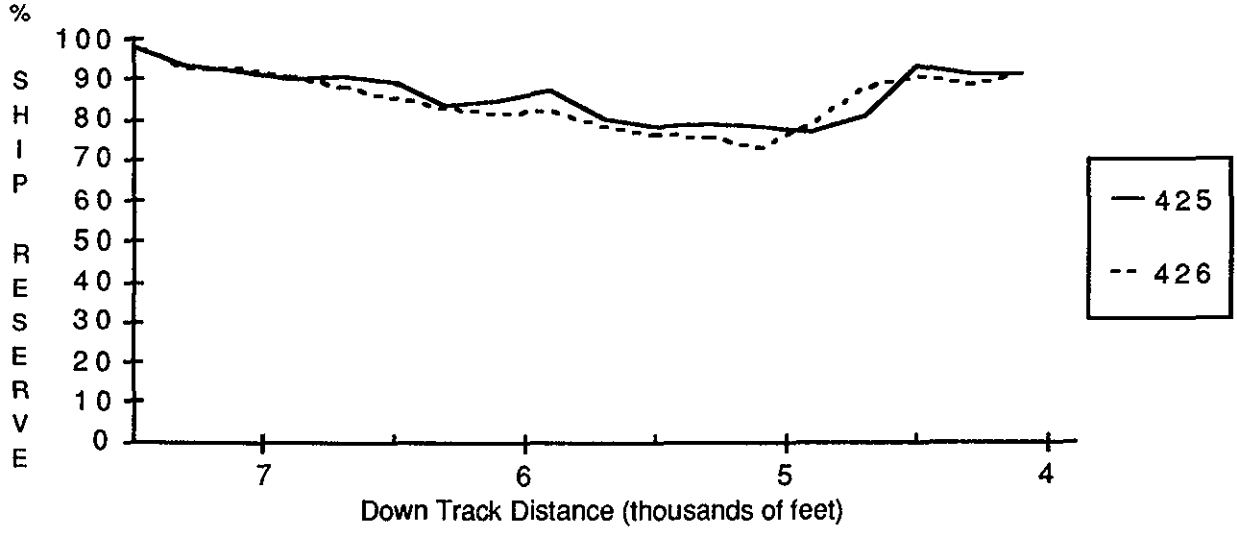

FIGURE B-8 Ship Reserve Control - Scenarios 425/426 (mean value, all pilots)

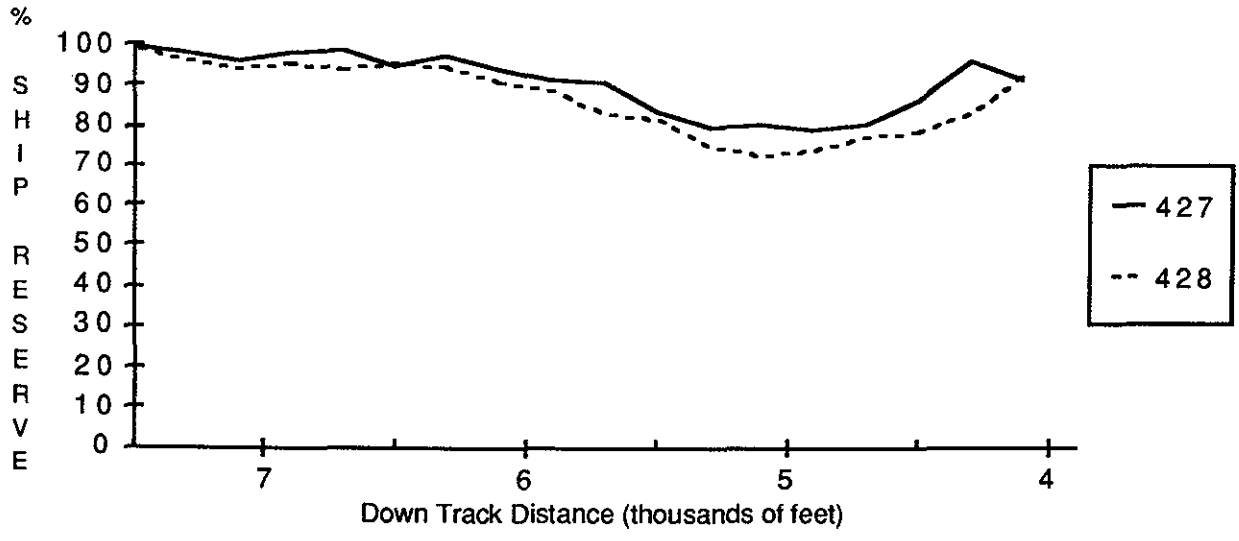

FIGURE B-9 Ship Reserve Control - Scenarios 427/428 (mean value, all pilots)

APPENDIX C

Tug Reserve Control Plots

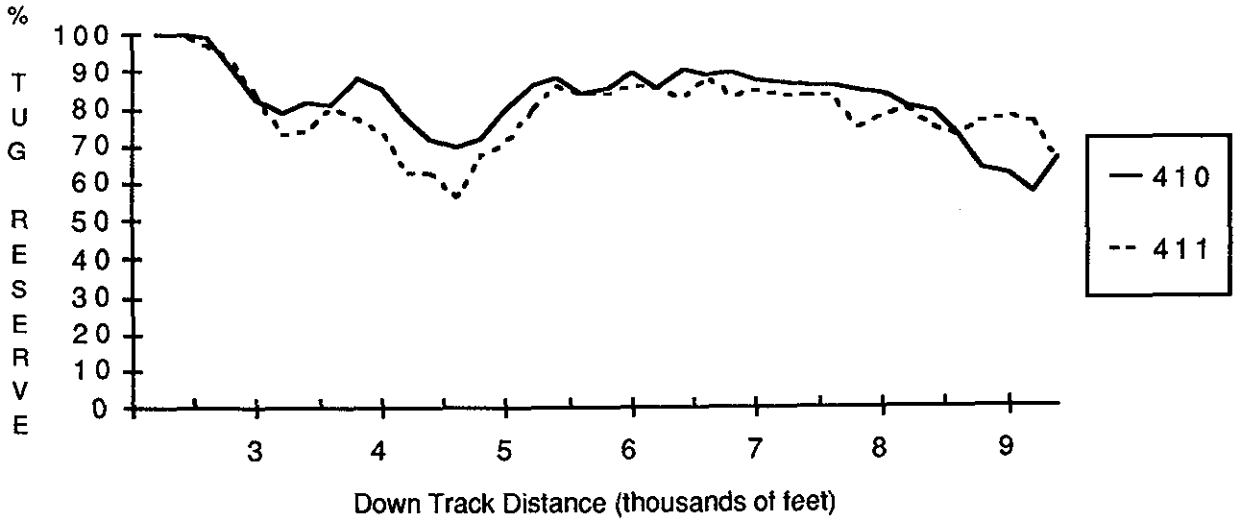

FIGURE C-1 Tug Reserve Control - Scenarios 410/411 (mean value, all pilots)

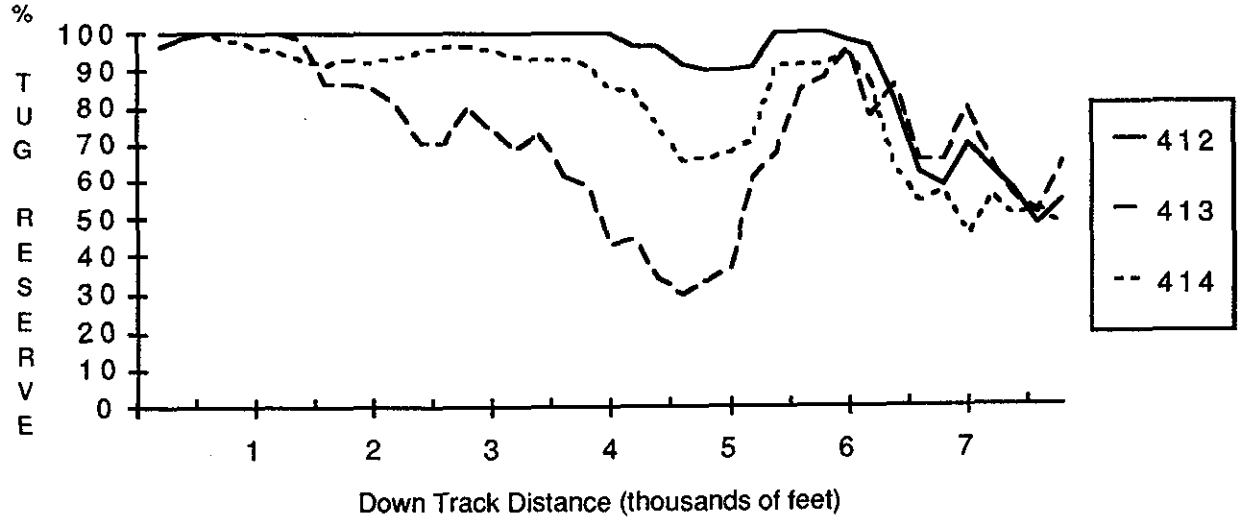

FIGURE C-2 Tug Reserve Control - Scenarios 412/413/414 (mean value, all pilots)

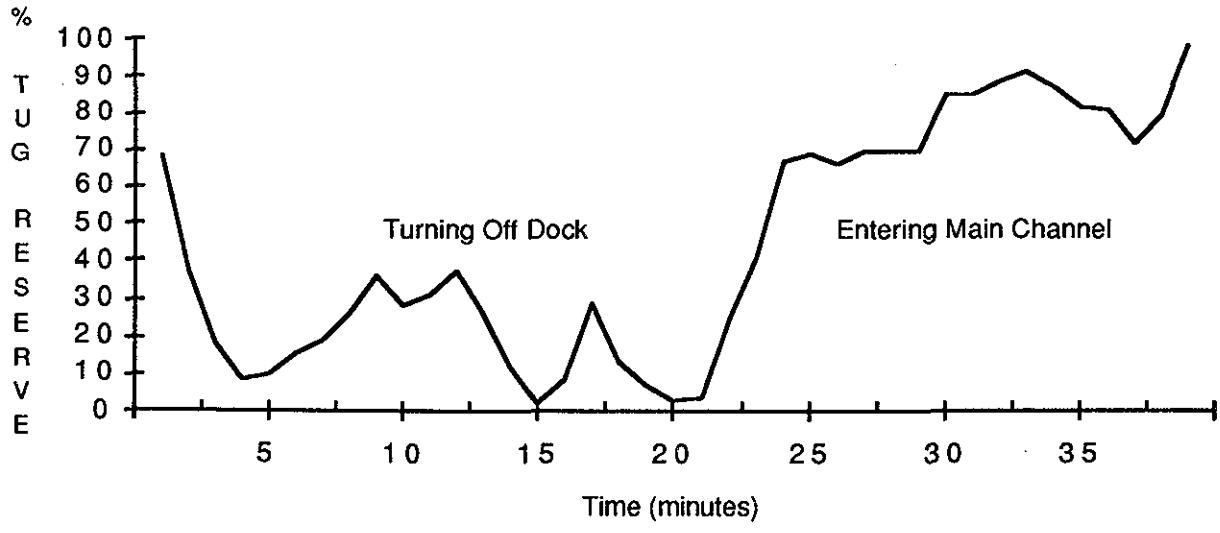

FIGURE C-3 Tug Reserve Control - Scenario 416 (mean value, all pilots)

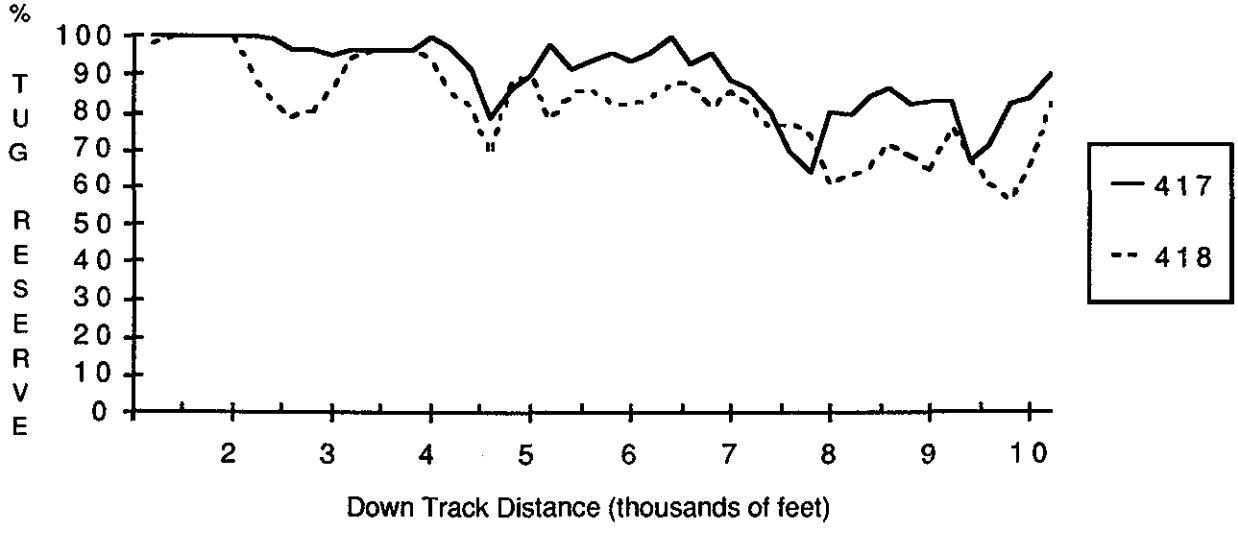

FIGURE C-4 Tug Reserve Control - Scenarios 417/418 (mean value, all pilots)

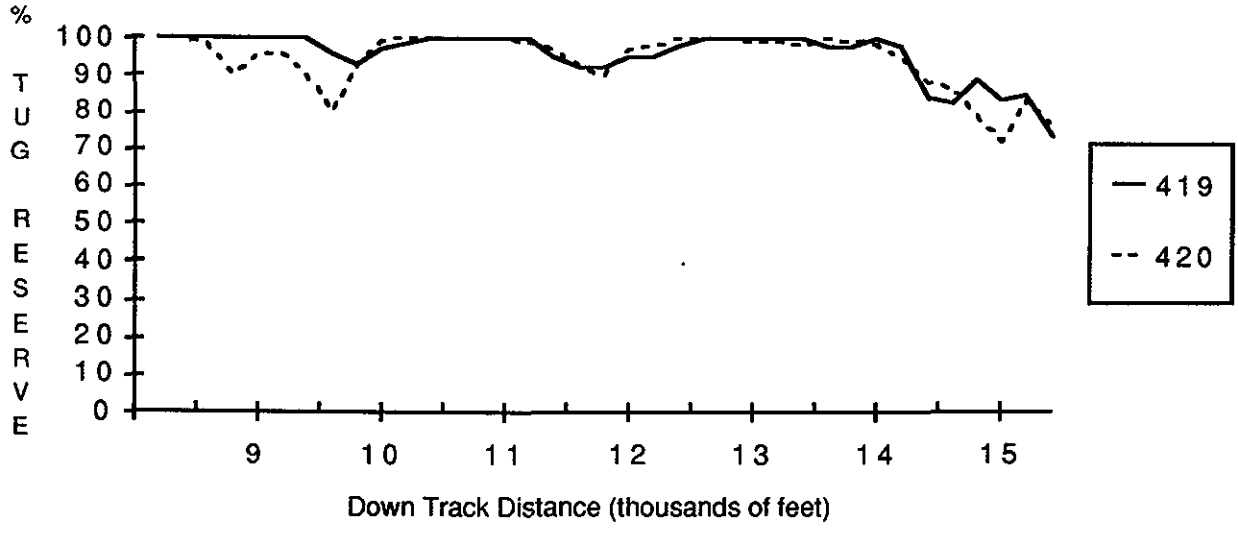

FIGURE C-5 Tug Reserve Control - Scenarios 419/420 (mean value, all pilots)

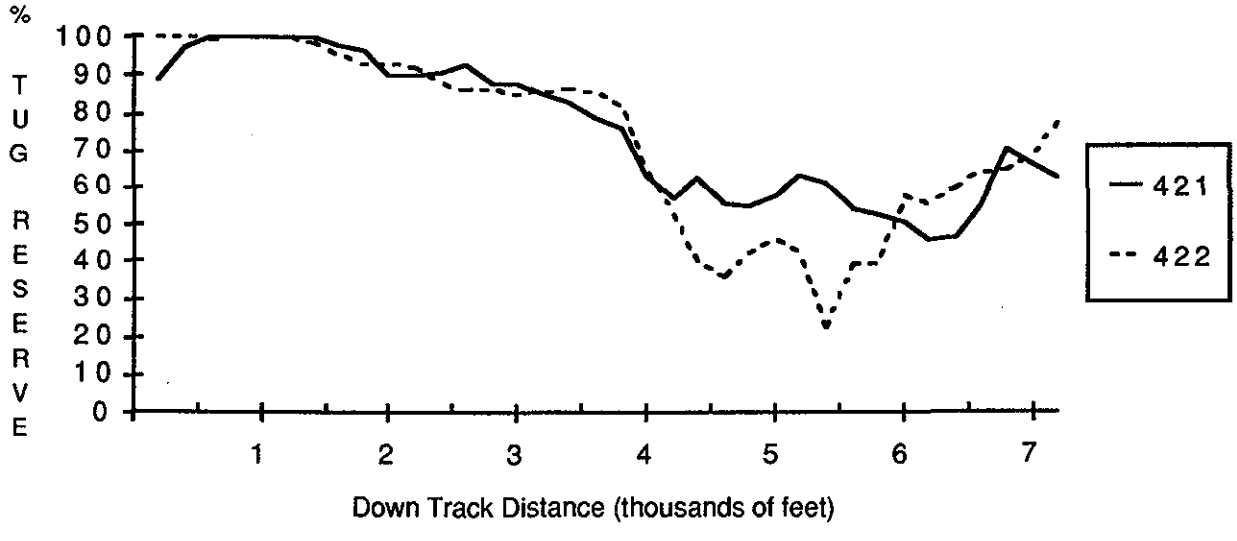

FIGURE C-6 Tug Reserve Control - Scenarios 421/422 (mean value, all pilots)

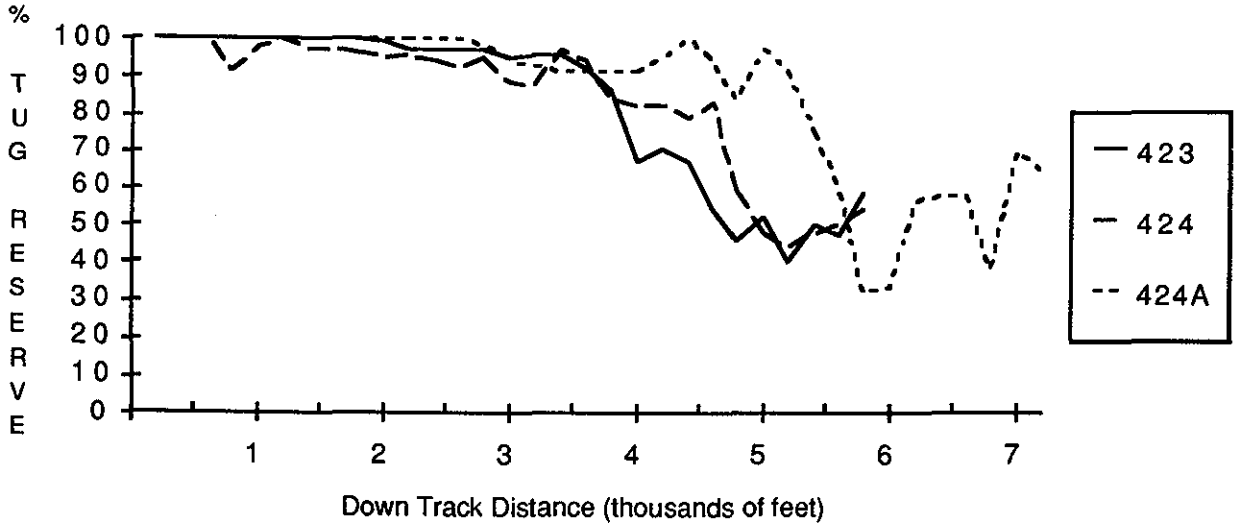

FIGURE C-7 Tug Reserve Control - Scenarios 423/424/424A (mean value, all pilots, except 424A - 3 pilots)

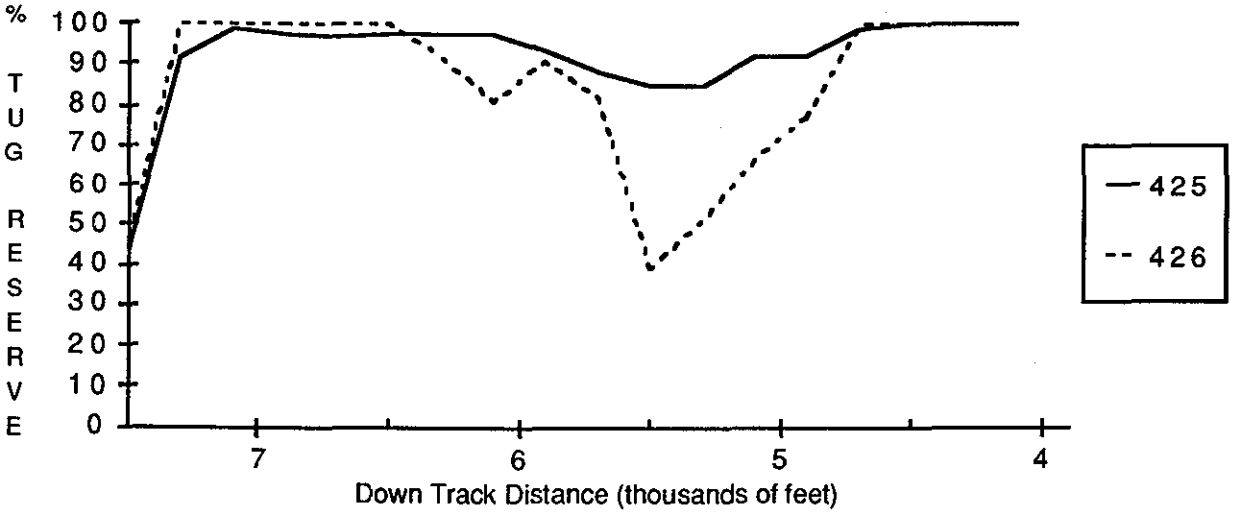

FIGURE C-8 Tug Reserve Control - Scenarios 425/426 (mean value, all pilots)

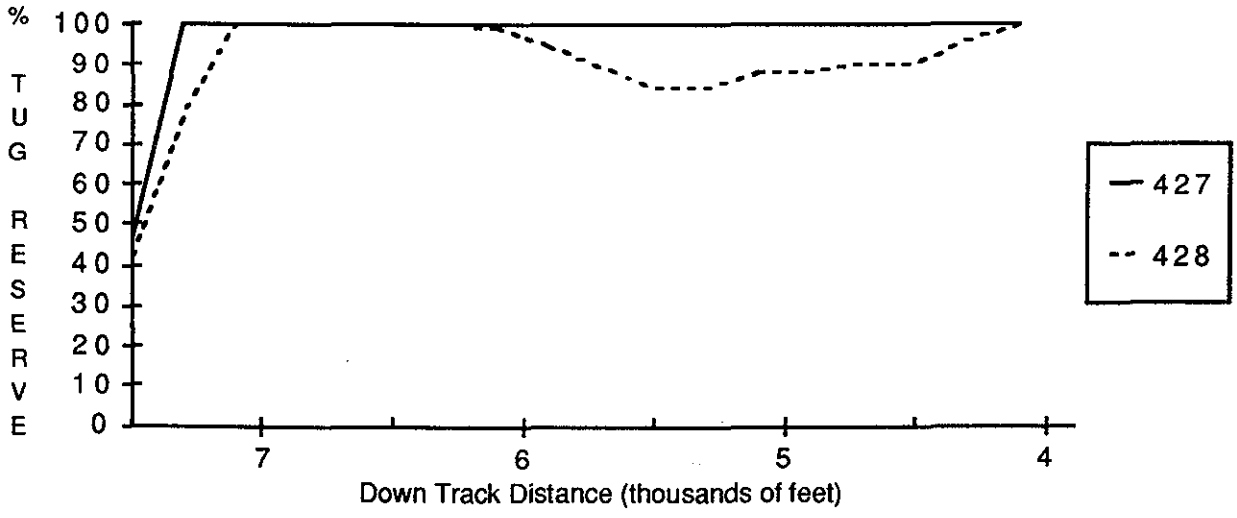

FIGURE C-9 Tug Reserve Control - Scenarios 427/428 (mean value, all pilots)

APPENDIX D

Pilot Evaluations of Safety

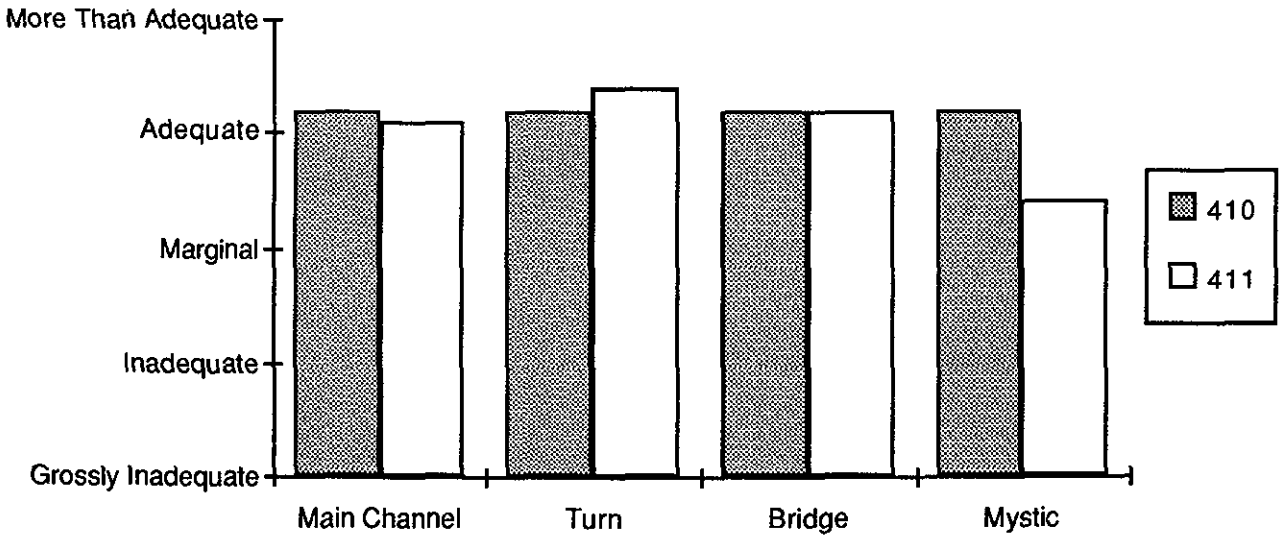

FIGURE D-1 Pilot Evaluation - Margin Of Safety - Scenarios 410/411 (mean value, all pilots)

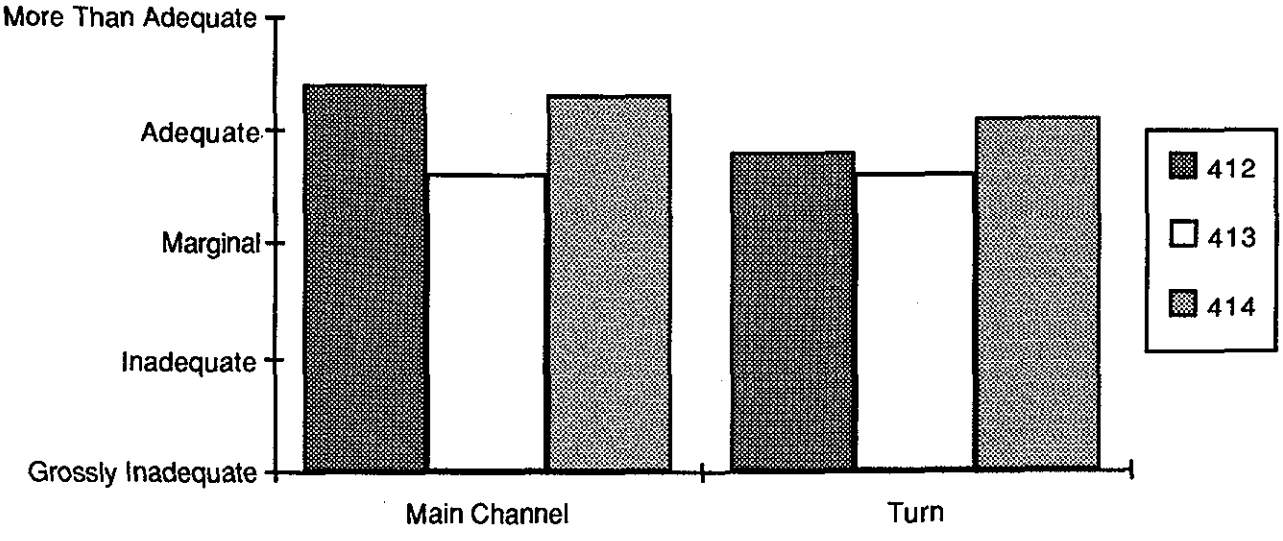

FIGURE D-2 Pilot Evaluation - Margin Of Safety - Scenarios 412/413/414 (mean value, all pilots)

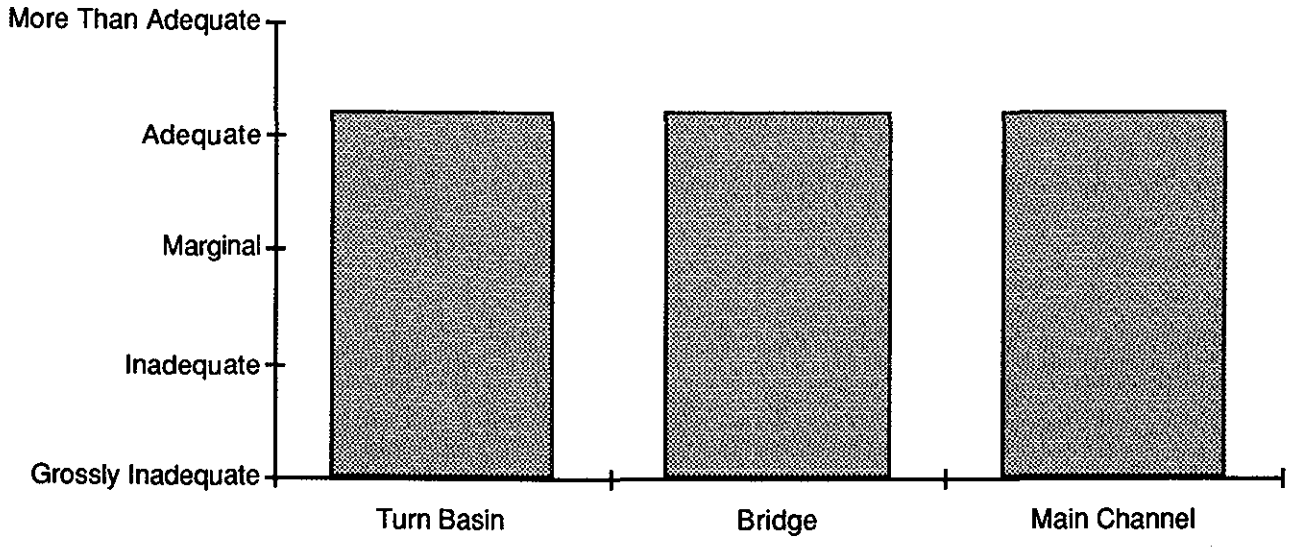

FIGURE D-3 Pilot Evaluation - Margin Of Safety - Scenario 416 (mean value, all pilots)

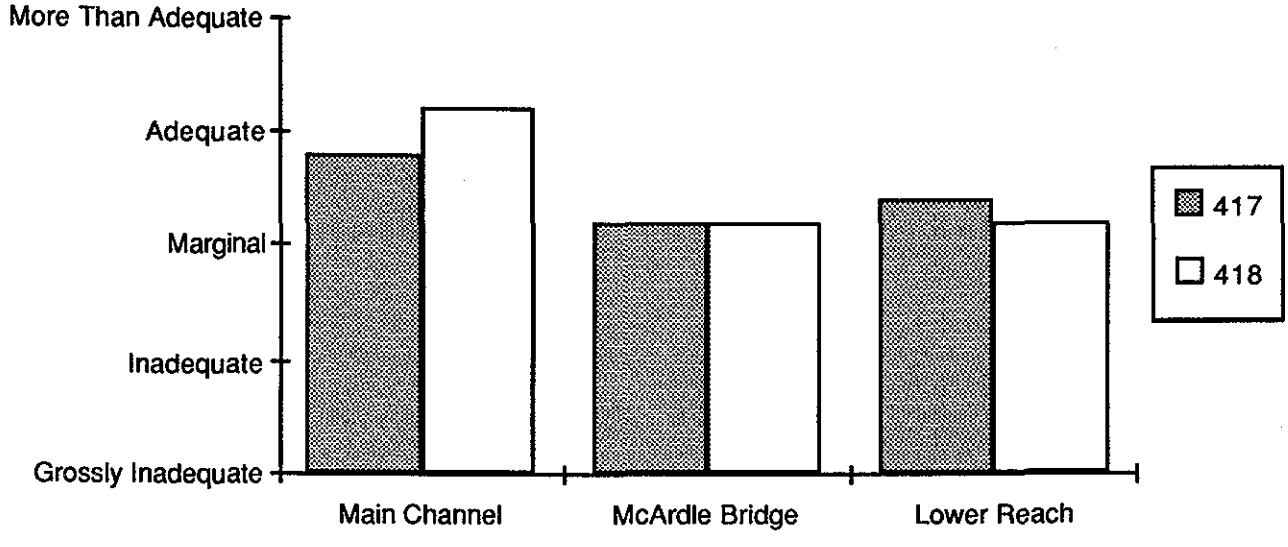

FIGURE D-4 Pilot Evaluation - Margin Of Safety - Scenario 417/418 (mean value, all pilots)

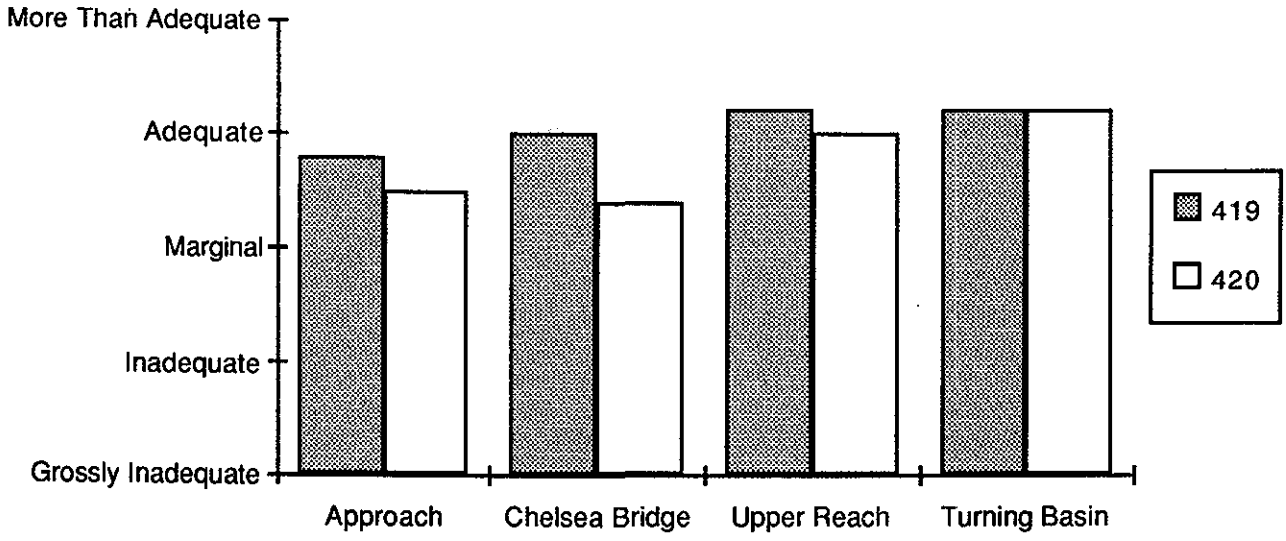

FIGURE D-5 Pilot Evaluation - Margin Of Safety - Scenario 419/420 (mean value, all pilots)

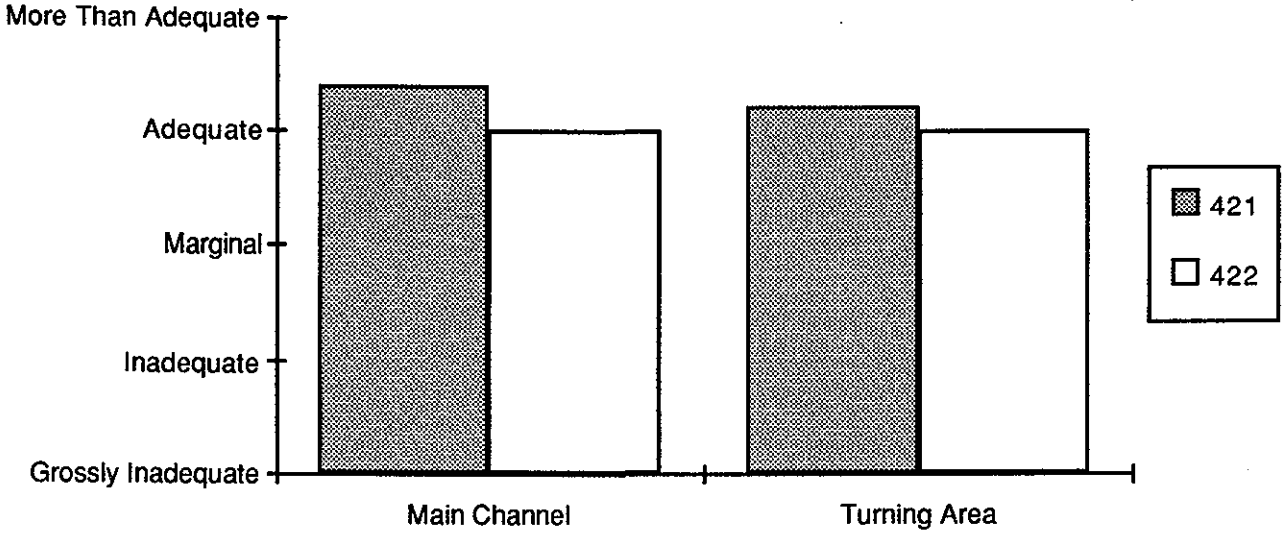

FIGURE D-6 Pilot Evaluation - Margin Of Safety - Scenario 421/422 (mean value, all pilots)

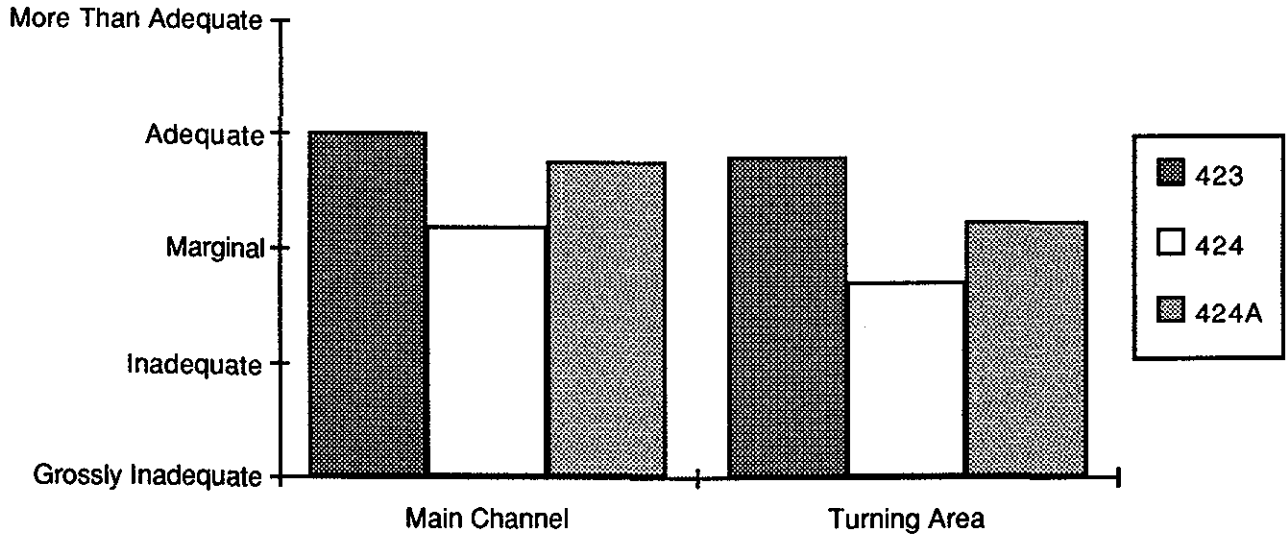

FIGURE D-7 Pilot Evaluation - Margin Of Safety - Scenario 423/424/424A (mean value, all pilots) 424A - 2 pilots

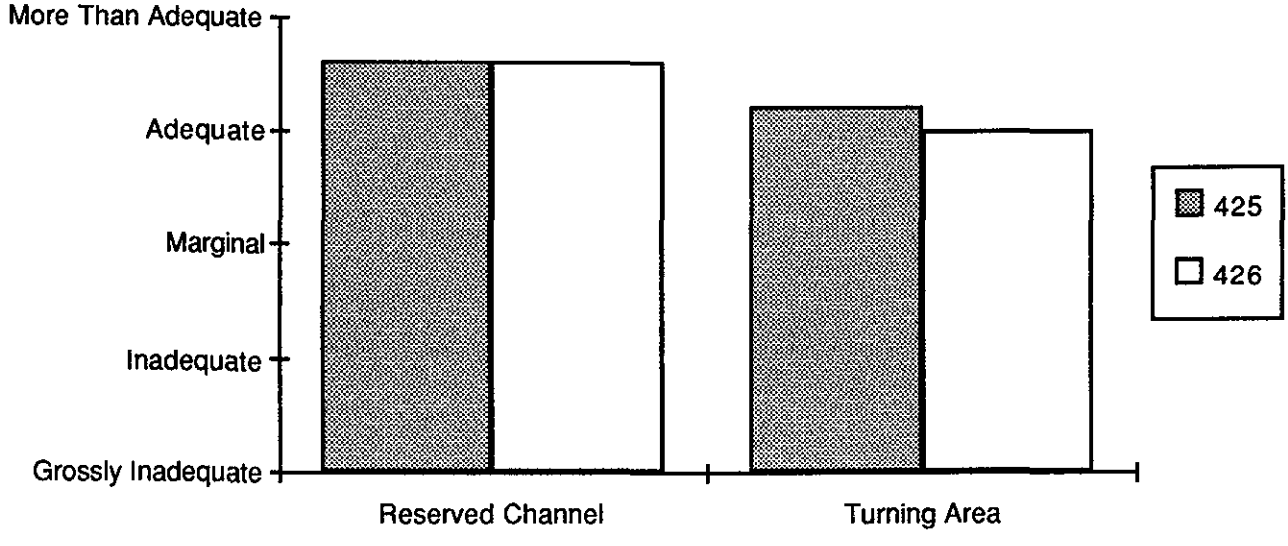

FIGURE D-8 Pilot Evaluation - Margin Of Safety - Scenario 425/426 (mean value, all pilots)

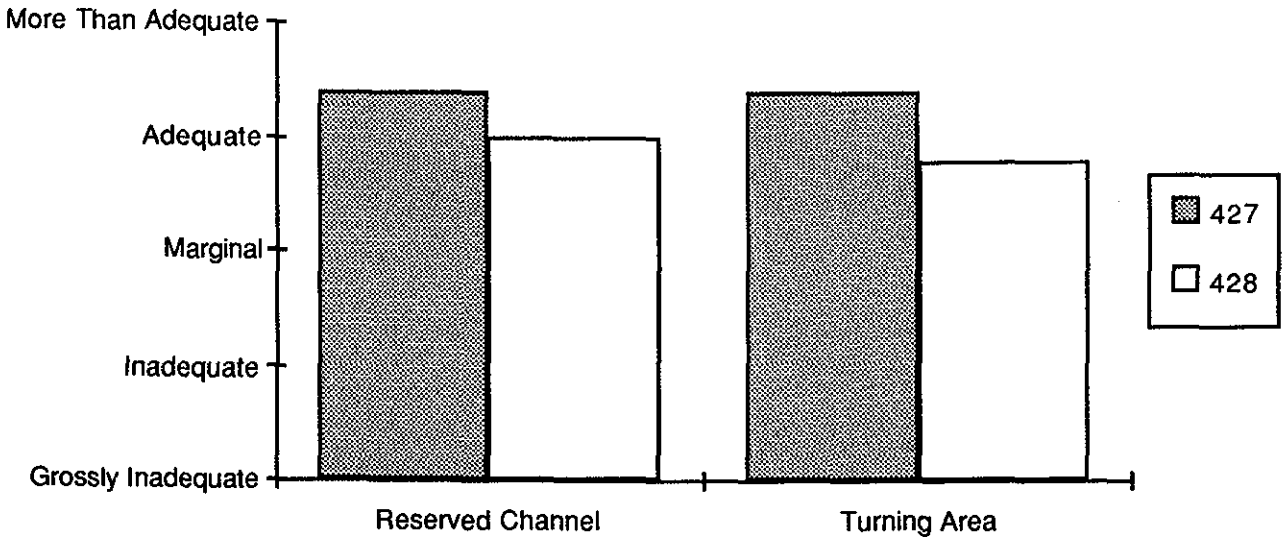

FIGURE D-9 Pilot Evaluation - Margin Of Safety - Scenario 427/428 (mean value, all pilots)

APPENDIX E

Samples of Scenario Debriefing Forms

BOSTON SIMULATION STUDY

SCENARIO DEBRIEFING FORM

Mystic River, LNG, Inbound - Scenarios 410, 411

Pilot #_____ File # _____

Based on the simulated transit you have just completed, please comment on the following:

1. Margin of safety in Main Ship Channel was:
   - _ More than Adequate
   - _ Adequate
   - _ Marginal
   - _ Inadequate
   - _ Grossly inadequate

2. Margin of safety during turning maneuver was:
   - _ More than Adequate
   - _ Adequate
   - _ Marginal
   - _ Inadequate
   - _ Grossly inadequate

3. Margin of safety during passage under the Mystic bridge was:
   - _ More than Adequate
   - _ Adequate
   - _ Marginal
   - _ Inadequate
   - _ Grossly inadequate

4. Margin of safety while backing in Mystic River was:
   - _ More than Adequate
   - _ Adequate
   - _ Marginal
   - _ Inadequate
   - _ Grossly inadequate

5. Total tug assistance, in terms of horsepower, required to safely accomplish this maneuver would be: _____ hp

(answer may differ from the tug hp used in the simulation = 13,200 hp)

6. Would you do this maneuver any differently if you had the chance to do it again? please explain:

_____

_____

_____

_____

7. Was there any aspect of the simulation that had an adverse or beneficial effect on this maneuver? _____

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Comments: _____

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BOSTON SIMULATION STUDY

SCENARIO DEBRIEFING FORM

Reserved Channel, Panamax Container, Inbound, scenarios 423, 424

Pilot #_____ File # _____

Based on the simulated transit you have just completed, please comment on the following:

1. Margin of safety in Main Ship Channel was:
   - _ More than Adequate
   - _ Adequate
   - _ Marginal
   - _ Inadequate
   - _ Grossly inadequate

2. Margin of safety during the turning maneuver was:
   - _ More than Adequate
   - _ Adequate
   - _ Marginal
   - _ Inadequate
   - _ Grossly inadequate

3. Total tug assistance, in terms of horsepower, required to safely accomplish this maneuver would be: _____ hp
(answer may differ from the tug hp used in this simulation = 8,600 hp)

4. Would you do this maneuver any differently if you had the chance to do it again? please explain:

_____

_____

_____

_____

5. Were there any aspect of the simulation that had an adverse or beneficial effect on this maneuver? _____

_____

Comments:

APPENDIX F

Completed Study Debriefing Forms

BOSTON SIMULATION STUDY

Test Pilot Debriefing Form

Pilot # 1

If additional room is needed to answer any questions, please use the space provided at the end of this form or add extra sheets.

Background

1. How long have you been a Docking Master in the port of Boston?
   22 years

2. How many dockings/undockings have you made in the Mystic River?
   approximately 35 dockings/undockings in the last 12 months

3. How many dockings/undockings have you made in the Chelsea River lower reach?
   approximately 10 dockings/undockings in the last 12 months

4. How many dockings/undockings have you made in the Chelsea River upper reach?
   approximately 75 dockings/undockings in the last 12 months

5. How many dockings/undockings have you made in the Reserved Channel?
   approximately 80 dockings/undockings in the last 12 months

Simulation Modeling

6. Did the simulated ship models listed below behave in a manner consistent with vessels of similar type, size, displacement and powering? If not, how did they differ?

Ship	Existing	Planned
LNG DWT Tanker	38 ft. YES	42 ft. YES
50K DWT Tanker	38.5 ft. YES	42 ft. YES
41K DWT Tanker	38 ft. YES	42 ft. YES
87K DWT Tanker	38 ft. NO	45 ft. NO BOTH SEEMED A BIT SLOWER WITH EVEN 45

Panamax Container	36 ft.	40 ft.
APL C8 Container	34.5 ft.	40 ft.

Comments ? ALL INBOUND VESSELS BACK TUG INTO THE RESERVED CHANNEL SEEMED A BIT SLOWER TO TURN THAN ACTUALITY. THE DYNAMIC OUTBOUND EXERCISES WERE TRUE

7. How would you characterize the effect of the simulated currents on the test ships?

Flood	EBB
_ Much stronger than anticipated	_ Much stronger than anticipated
X Stronger than anticipated	_ Stronger than anticipated
_ As anticipated	X As anticipated
_ Weaker than anticipated	_ Weaker than anticipated
_ Much weaker than anticipated	_ Much weaker than anticipated

Comments? THE FLOOD TIDE ON THE INBOUND TURN OFF THE END OF THE RESERVED CHANNEL SEEMED A LITTLE STRONGER THAN USUAL.

8. How would you characterize the effect of the simulated tug boat forces?

_ Much stronger than anticipated
_ Stronger than anticipated
X As anticipated
_ Weaker than anticipated
_ Much weaker than anticipated

Comments? AGAIN, THE SLOW TURN AT THE RESERVED CHANNEL MAY HAVE BEEN WEAKER TUG EFFECT.

9. How would you rate the overall realisim and accuracy of the simulation models?

- [x] Very Good
- [ ] Good
- [ ] Adequate
- [ ] Poor
- [ ] Very Poor

10. Were there any characteristics of the simulation models that may have caused you or the simulated vessels to react in a manner different than what you would anticipate in the real world?

THE LACK OF DEPTH PERCEPTION MADE IT DIFFICULT TO FEEL THE RIGHT TIME TO TURN. THIS HOWEVER, WAS REMEDIED WITH THE INCLUSION OF THE OVERHEAD VIEW MONITOR.

11. Please use the space provided at the end of this form to suggest how the fidelity and utility of the Boston model can be improved.

Structured Simulation Test

12. Can the proposed channel configurations tested, safely and efficiently accommodate the test vessels used? Would you anticipate any operational restrictions? Please explain.

Mystic River (40 ft.) THE BUOYED CORNER OF THE 35' SECTION OF THE MYSTIC MIGHT BE RESTRICTIVE IN DIVERSE WEATHER CONDITIONS. PERHAPS IT COULD BE TAPERED MORE TO ALLOW MORE ROOM PASSING A SHIP AT EXXON DOCK.

Inner Confluence (40 ft.) THIS DAM CERTAINLY MAKES TURNING DEEPER LNG SHIPS SAFER. IT ALSO ENHANCES THE APPROACHES BOTH TO ATLANTIC AVE. AND MCARDLE BRIDGE

Chelsea River (38 ft.) PASSING SHIPS OR BARGES MOORED AT MOBIL WITH MAXIMUM DRAFT SHIPS COULD BE TIGHT. THIS COULD BE MORE CLEARLY ASCERTAINED LATER.

Reserved Channel (40 ft.) JUDGING THE LIMITS OF THE 40' NOTCH INTO THE 35' SIDE OF THE CHANNEL WOULD BE DIFFICULT.

13. Would you recommend any changes to the channel configurations or aids to navigation scheme to better accommodate these vessels? (please mark-up the attached diagrams)

_ No

X Yes - Please explain

THE 35' AREA IN THE MYSTIC AS PREVIOUSLY EXPLAINED.

PERHAPS A COUPLE OF MARKERS ON THE RED SIDE CHANNEL LINE TO INDICATE THE UPPER AND LOWER LIMITS OF THE 40' NOTCH IN THE RESERVED CHANNEL

14. Do you feel that the Inner Confluence area needs to be widened as in the "planned configuration"

_ No

X Yes - Please explain

IT WOULD ALLOW A GREATER SAFETY MARGIN FOR TURNING THE LNG SHIPS, AND ALSO PROVIDE FOR BETTER APPROACH TO PASS UNDER THE TOBIN BRIDGE WITH A DEEP TANKER FOR EXXON.

15. Do you feel that the configuration in "plan 2" is required?

_ No

X Yes - Please explain

I THINK THAT THE APPROACHES TO BOTH EXXON AND ATLANTIC FUEL WITH DEEP LOADED SHIPS NEED THIS ROOM

16. Are there other situations in the real world that would be considered more severe scenarios than those tested?

X No

_ Yes - Please explain

20. Please use the attached sheets and diagrams to comment on any aspect of this study.

Thank you!

THE SIMULATIONS OF THE VARIOUS DOCKING AND UNDOCKING DRILLS WERE VERY REALISTIC. I ATTRIBUTE MY STATE OF FATIGUE AT THE END OF EACH DAY TO THIS FACT.

THE PEOPLE WITH WHOM I WORKED WERE VERY HELPFUL AND SUPPORTIVE. IT TOOK A FEW DRILLS FOR ME TO BECOME ACCUSTOMED TO THE SIMULATOR AND THEY WERE VERY PATIENT.

THANKS

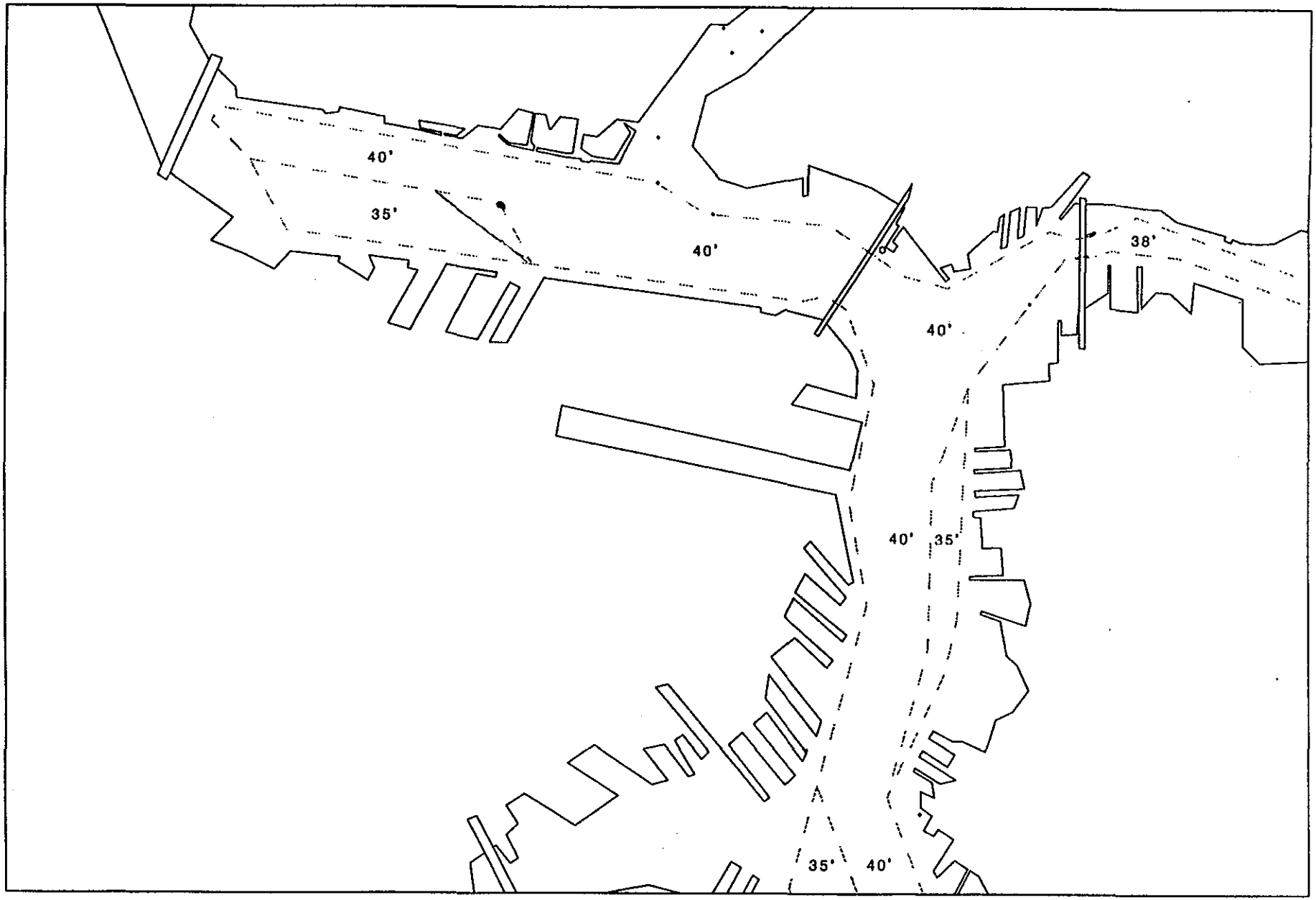


FIGURE 3 Planned Configuration - sheet 1 of 3

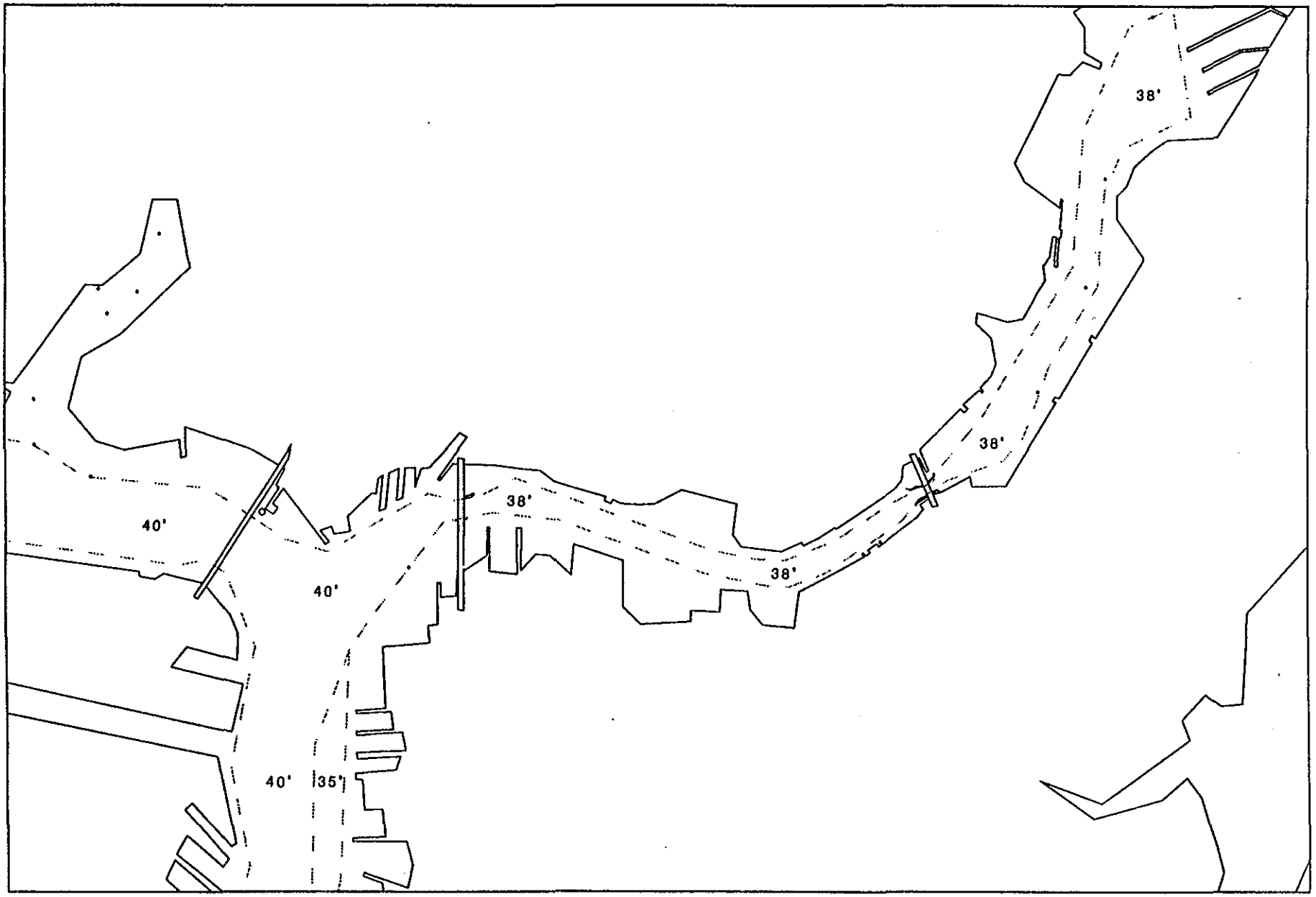


FIGURE 3 Planned Configuration - sheet 2 of 3

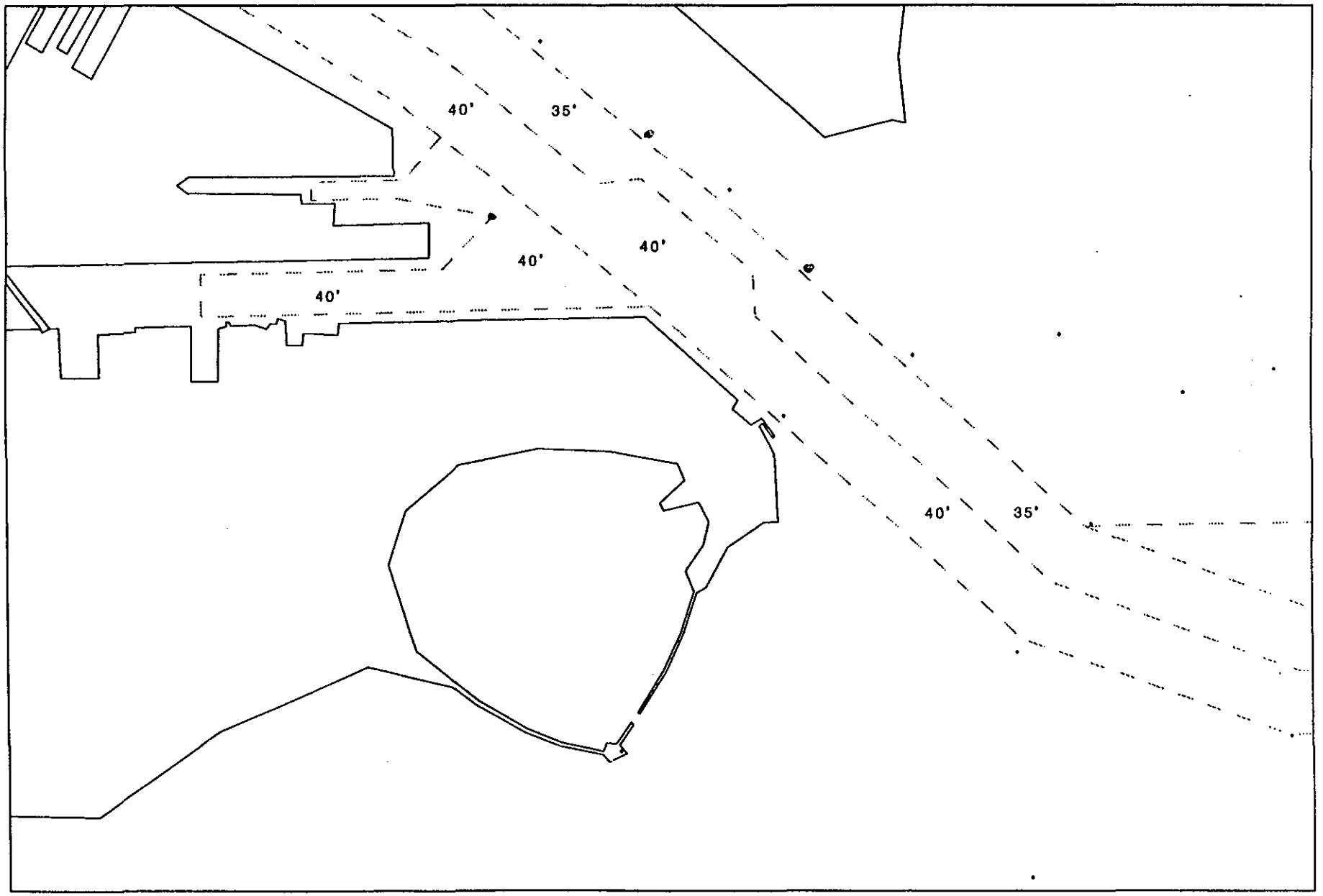


FIGURE 3 Planned Configuration sheet 3 of 3

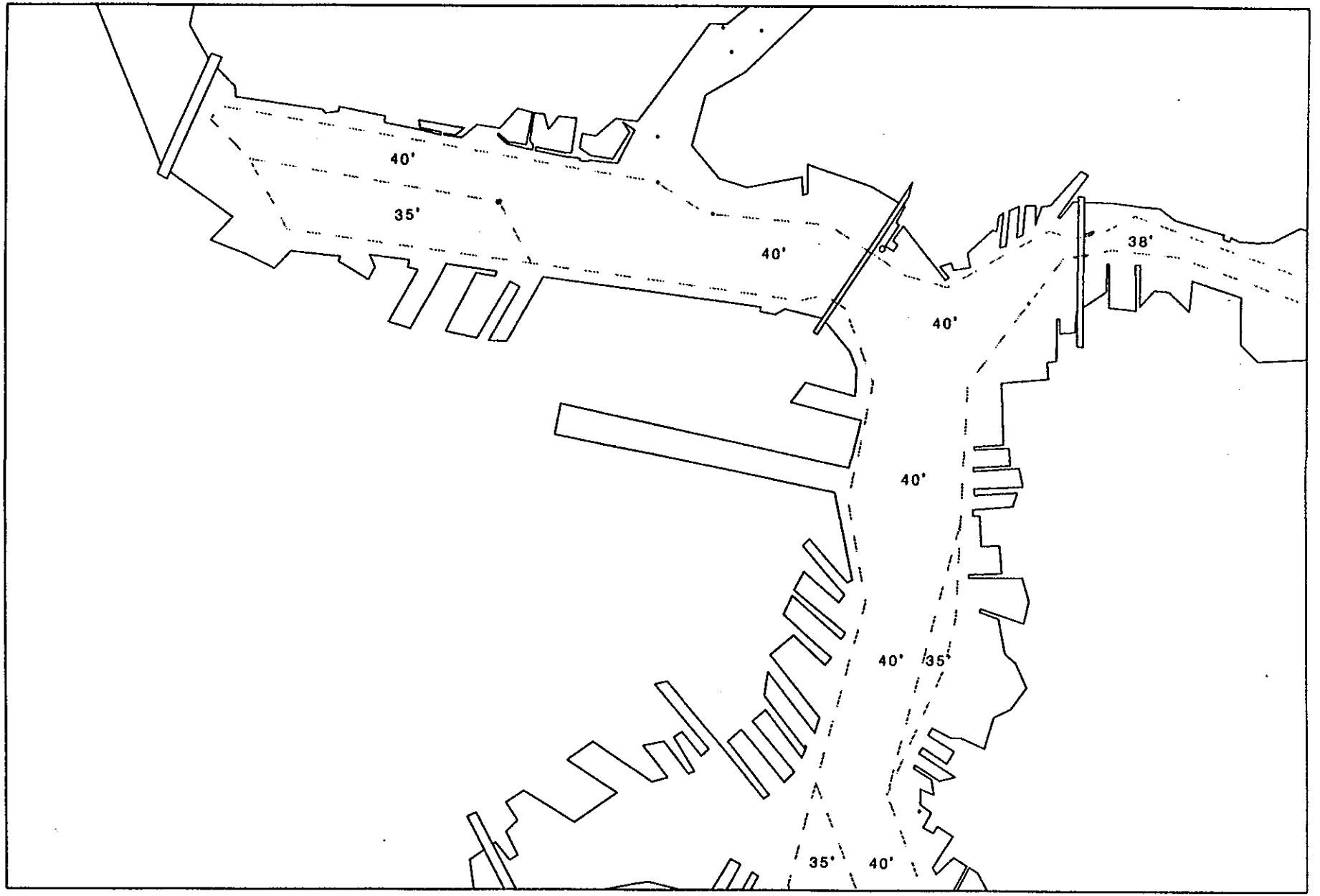


FIGURE 4 Plan 2 Configuration

BOSTON SIMULATION STUDY

Test Pilot Debriefing Form

Pilot # 2

If additional room is needed to answer any questions, please use the space provided at the end of this form or add extra sheets.

Background

1. How long have you been a Docking Master in the port of Boston?
   6 years

2. How many dockings/undockings have you made in the Mystic River?
   approximately 100 dockings/undockings in the last 12 months

3. How many dockings/undockings have you made in the Chelsea River lower reach?
   approximately 20 dockings/undockings in the last 12 months

4. How many dockings/undockings have you made in the Chelsea River upper reach?
   approximately 100+ dockings/undockings in the last 12 months

5. How many dockings/undockings have you made in the Reserved Channel?
   approximately 100 dockings/undockings in the last 12 months

Simulation Modeling

6. Did the simulated ship models listed below behave in a manner consistent with vessels of similar type, size, displacement and powering? If not, how did they differ?

Ship	Existing	Planned
LNG DWT Tanker	38 ft. yes	42 ft.
50K DWT Tanker	38.5 ft. yes	42 ft.
41K DWT Tanker	38 ft. yes	42 ft.
87K DWT Tanker	38 ft. yes	45 ft.
Panamax Container	36 ft. no	40 ft.
APL C8 Container	34.5 ft. no	40 ft.

Comments ? NORMALLY IN THE PORT OF BOSTON, THE [illegible] VESSELS IN EXCESS OF 34'. (DUE TO [illegible] DRAFT [illegible]) [illegible] IN ALL [illegible] IT IS [illegible] TO [illegible] [illegible] STEERED [illegible] TO TURN [illegible] TO RESERVED CHANNEL. THE [illegible] TO BE [illegible]!!"

7. How would you characterize the effect of the simulated currents on the test ships?

Flood

_ Much stronger than anticipated

_ Stronger than anticipated

X As anticipated

_ Weaker than anticipated

_ Much weaker than anticipated

EBB

_ Much stronger than anticipated

X Stronger than anticipated

_ As anticipated

_ Weaker than anticipated

_ Much weaker than anticipated

Comments? SIMULATED [illegible] SEEMED [illegible] IN ALL [illegible] EXCEPT IN THE RESERVED CHANNEL SCENARIOS. ON BOTH FLOOD & EBB IT SEEMED THE [illegible] FORCES WERE STRONGER (.25 KNOT [illegible]) THAN [illegible].

8. How would you characterize the effect of the simulated tug boat forces?

_ Much stronger than anticipated

_ Stronger than anticipated

_ As anticipated

* X Weaker than anticipated

_ Much weaker than anticipated

Comments? * TUG FORCES SEEMED "WEAKER THAN ANTICIPATED" in the RESERVED CHANNEL SCENARIOS ONLY!!

9. How would you rate the overall realisim and accuracy of the simulation models?

X Very Good

_ Good

_ Adequate

_ Poor

_ Very Poor

10. Were there any characteristics of the simulation models that may have caused you or the simulated vessels to react in a manner different than what you would anticipate in the real world?

YES - ① ON SCENARIO 4/16 I FELT THAT PORTION OF THE OUTBOUND CHANNEL ON APPROACH TO TURN RADIUS WAS FURTHER TO THE LEFT THAN ONE MIGHT SHIP BRIDGE!!
② ON SCENARIOS 421, 423 IT FELT THAT WITH A FLOOD TIDE SHIP WOULD HAVE GAINED A LITTLE QUICKER
③ WHEN MAKING TURNS (IE: MYSTIC RIVER APPROACH) THE SHIP WOULD OBVIOUSLY LOSE HEADWAY DURING TURN (APPROX ½ - 1½ KNOTS)

11. Please use the space provided at the end of this form to suggest how the fidelity and utility of the Boston model can be improved.

Structured Simulation Test

12. Can the proposed channel configurations tested, safely and efficiently accommodate the test vessels used? Would you anticipate any operational restrictions? Please explain.

Mystic River (40 ft.) YES - IF FOR ANY REASON ONE HAD A MECHANICAL FAILURE ABOARD SHIP, I DON'T BELIEVE THAT THIS WOULD BE ENOUGH TO STOP SHIP FROM RUNNING AGROUND IN AREA INDICATED BY (YELLOW) INSERT (#1) ON PAGE 9.

ALSO DURING TRIP I WAS THINKING ABOUT ALL MARINERS TO KEEP TO WIDE TURNS. SHIP WAS ON SLOW AHEAD (A FAST AHEAD SPEED WOULD HAVE MADE TOO MUCH LEEWAY).

Inner Confluence (40 ft.) I DID NOT FEEL THAT [illegible] USE TO MAKE [illegible] WIDE TURNS AS THE [illegible] RIVER BY BUOY #1 (YOU MUST KEEP SHIP IN DEEP OF CHANNEL MAKING IT DIFFICULT TO MAKE TURN). ALSO AN OUTBOUND SHIP COULD UTILIZE EXTENDED AREA IN BUOY 2 IF TURN WAS MADE TOO WIDE).

Chelsea River (38 ft.) EXPECT HARBOR LIFE FAMILIARS MIGHT USE [illegible] CHANNEL).

Reserved Channel (40 ft.) I BELIEVE THAT THE PROPOSED CUT OUT OF CHANNEL - MARKED IN YELLOW) BUOY #11 BE EXPANDED TO ACCOMMODATE SWING OF TOW OF INBOUND SHIPS. WIDTH OF DREDGED AREA SHOULD BE MARKED BY BUOYS.

13. Would you recommend any changes to the channel configurations or aids to navigation scheme to better accommodate these vessels? (please mark-up the attached diagrams)

_ No

X Yes - Please explain

(IT WOULD BE BENEFICIAL TO LOCATE [illegible] [illegible] PIER [illegible])

By DREDGING THIS AREA (AND MAINTAIN)
(A) DEEP/SAFE ACCESS OF INBOUND L.N.G. TO DISPOSE LOCAL
(B) ROOM OR AREA TO MANUV. CONTAINER SHIP OR
A TANKER THAT MIGHT HAVE SYS. FAILURE INBOUND TO EXXON

14. Do you feel that the Inner Confluence area needs to be widened as in the "planned configuration"

_ No

X Yes - Please explain (SEE #15 ALSO)
BY DREDGING THE AREA IN VICINITY OF BUOY #16
MORE ROOM FOR L.N.G.'S IS ACCOMPLISHED

15. Do you feel that the configuration in "plan 2" is required?
(Dredging of the 35' side of the Main Ship Channel to 40', downstream of the Inner Confluence)

_ No

X Yes - Please explain
TO ACCOMODATE IN BOUND DEEP LOADED SHIPS
IT IS OF GREAT BENEFIT TO BE ABLE TO MAKE
TURN AS WIDE AS POSSIBLE - IT WOULD
ALSO BENEFIT A OUT BOUND MYSTIC RIVER SHIP
IF A UNEXPECTED TUG / POWER FAILURE OCCURED.
IT WOULD GIVE YOU MORE ROOM TO GET
SHIP UNDER CONTROL BEFORE RUNNING OUT OF GOOD WATER

16. Are there other situations in the real world that would be considered more severe scenarios than the "worst case" scenarios we have tested?

X No

_ Yes - Please explain
WITH THE EXCEPTION OF "BAILOUT" MANUV.
IF SHIP LOST POWER TUGS LINES PASSED ECT.
(IE: MYSTIC RIVER INBOUND TANKER TO EXXON)

20. Please use the attached sheets and diagrams to comment on any aspect of this study.

Thank you!

"IMPROVEMENT OF THE BOSTON MODEL"—

(1) THE USE OF THE "OVERHEAD VIEW" MADE-UP FOR THE LOSS OF [illegible] ON SOME SCENARIOS (IE: BEHIND OIL MOUND) IT WAS SOMETIMES DIFFICULT TO GET A REAL "FEEL" FOR THE SHIPS MANEUVERING EVENLY WHEN APPROACHING THE PIERS. WITH INSTANT USE OF "OVERHEAD" VIEW IT WOULD HAVE BEEN VERY DIFFICULT TO LINE UP THE SHIP.

(2) REALISTIMEW OF THE EFFECTS OF WIND IN DIFFERENT SCENARIOS.

(3) ON SOME OCCASIONS WHEN COMING ALONGSIDE A SHIP I WOULD HAVE EXPECTED MORE OF A WALKOVER OF THE SHIP DUE TO [illegible] MOTION

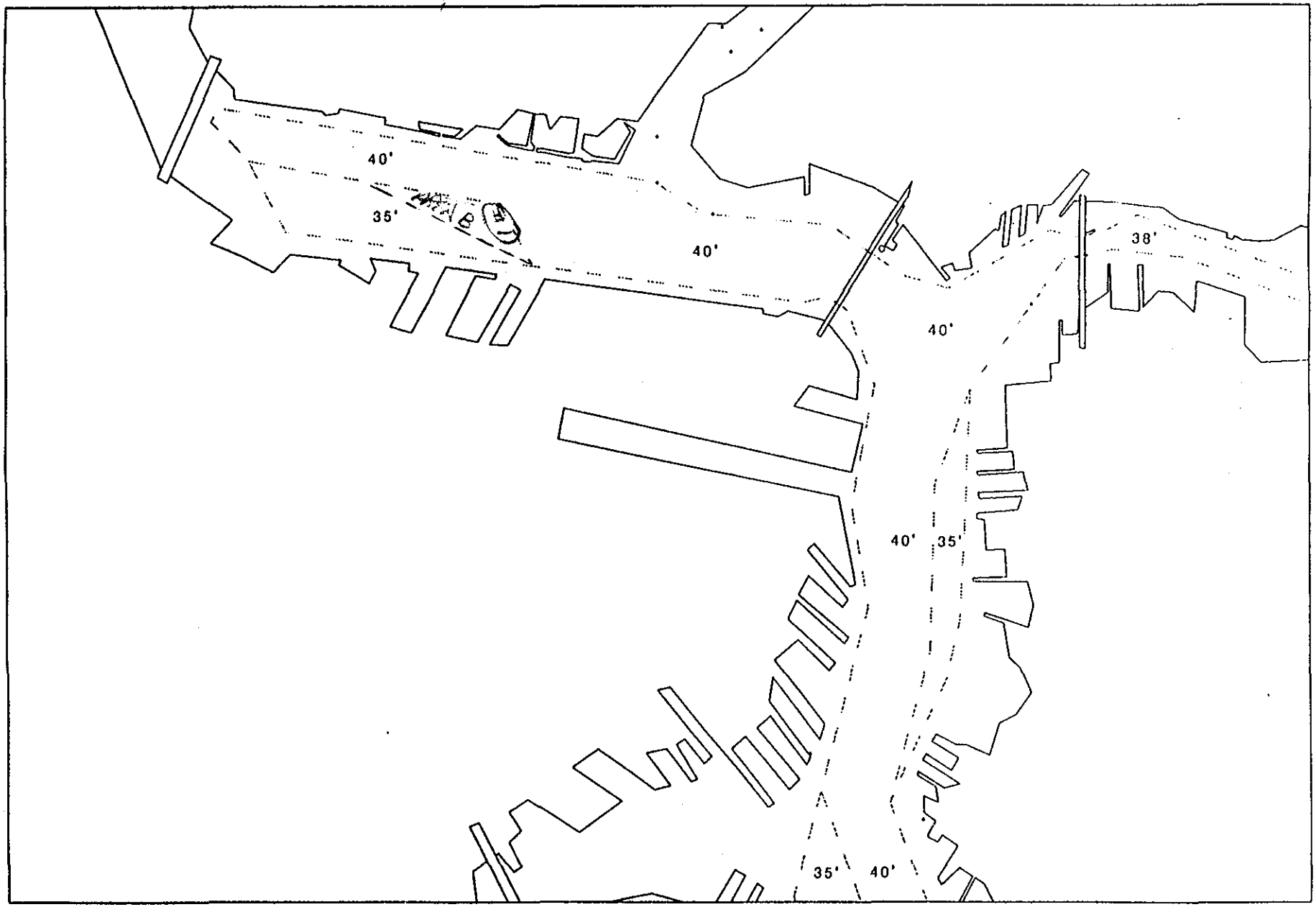


FIGURE 3 Planned Configuration - sheet 1 of 3

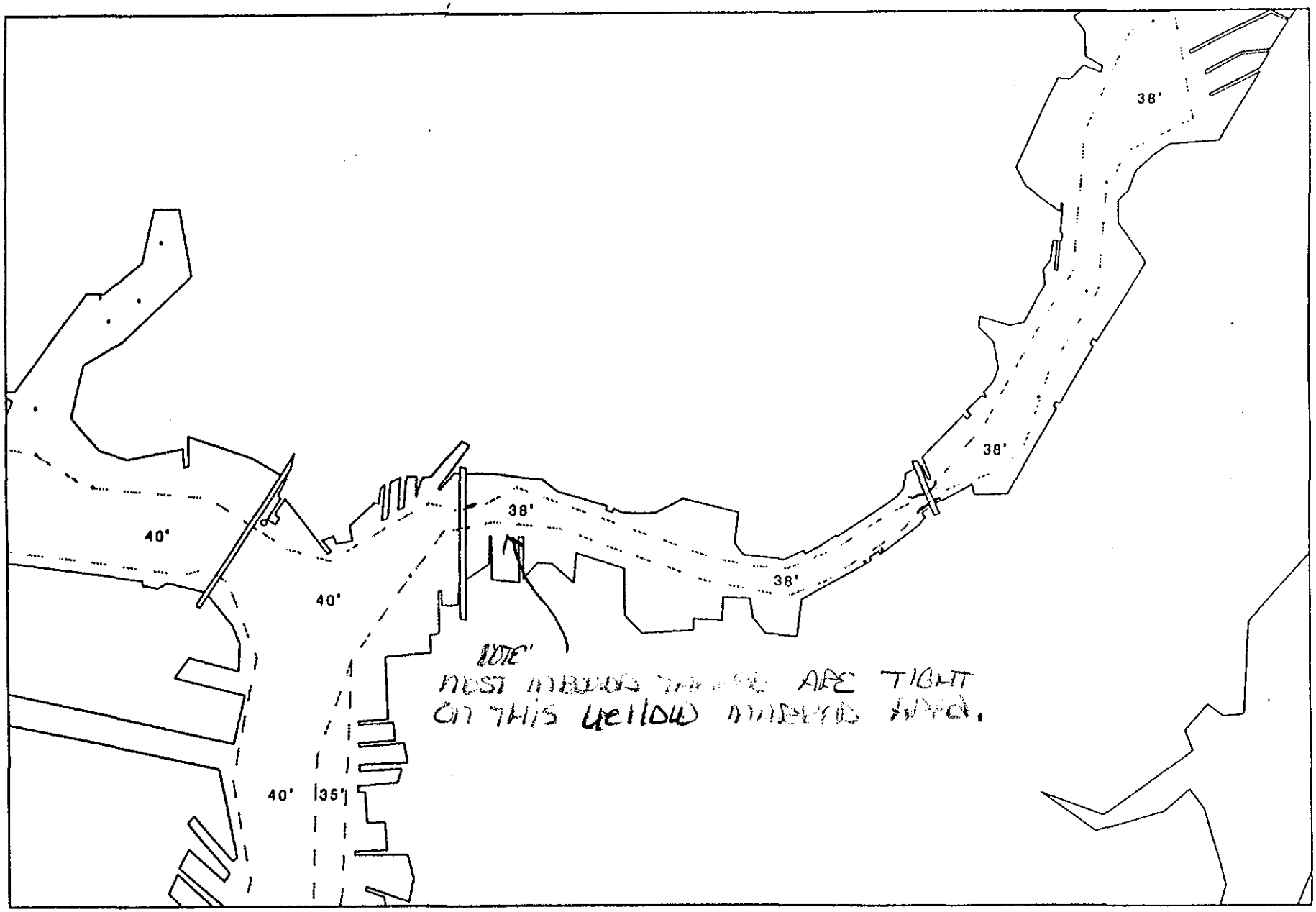


FIGURE 3 Planned Configuration - sheet 2 of 3

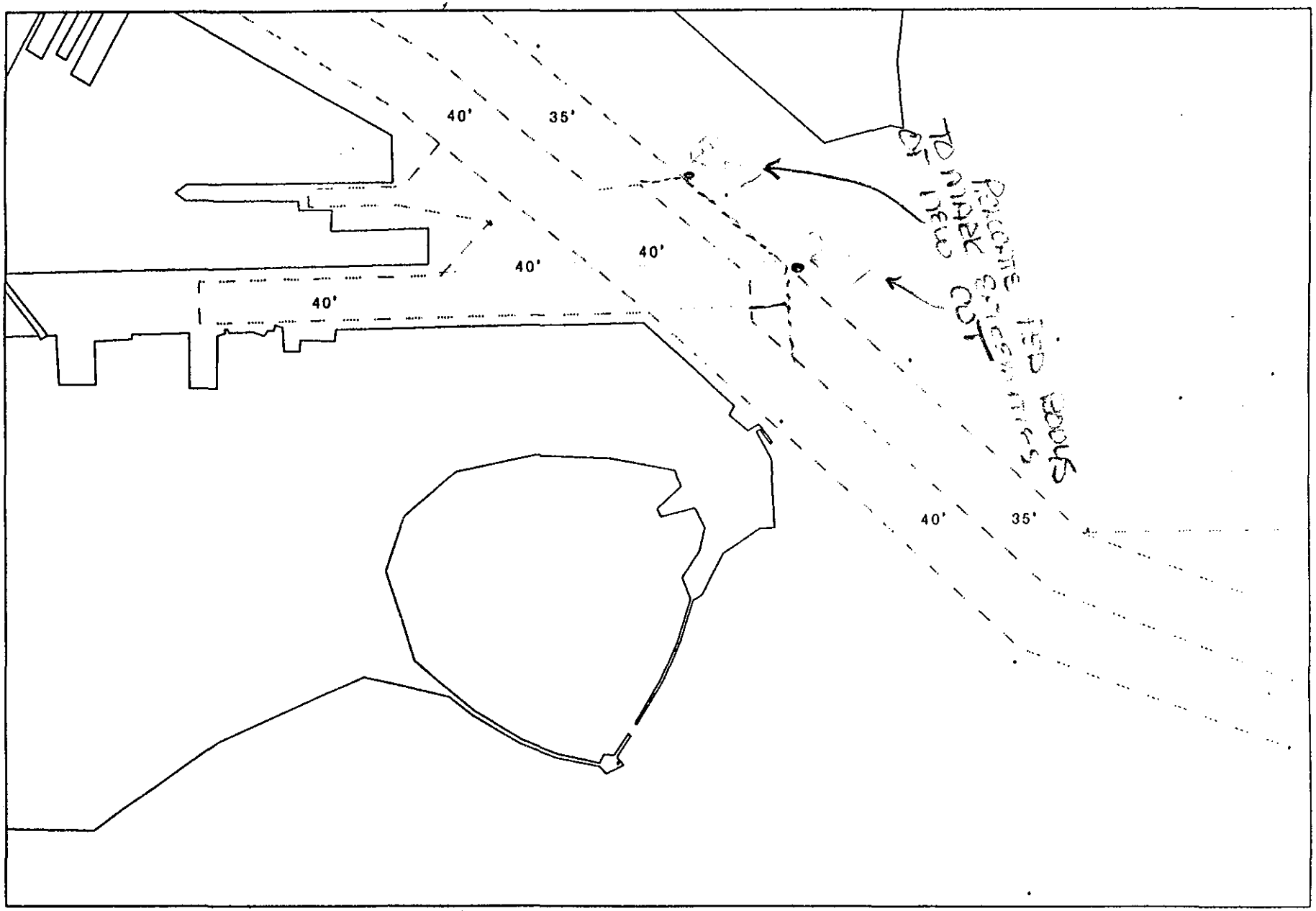


FIGURE 3 Planned Configuration sheet 3 of 3

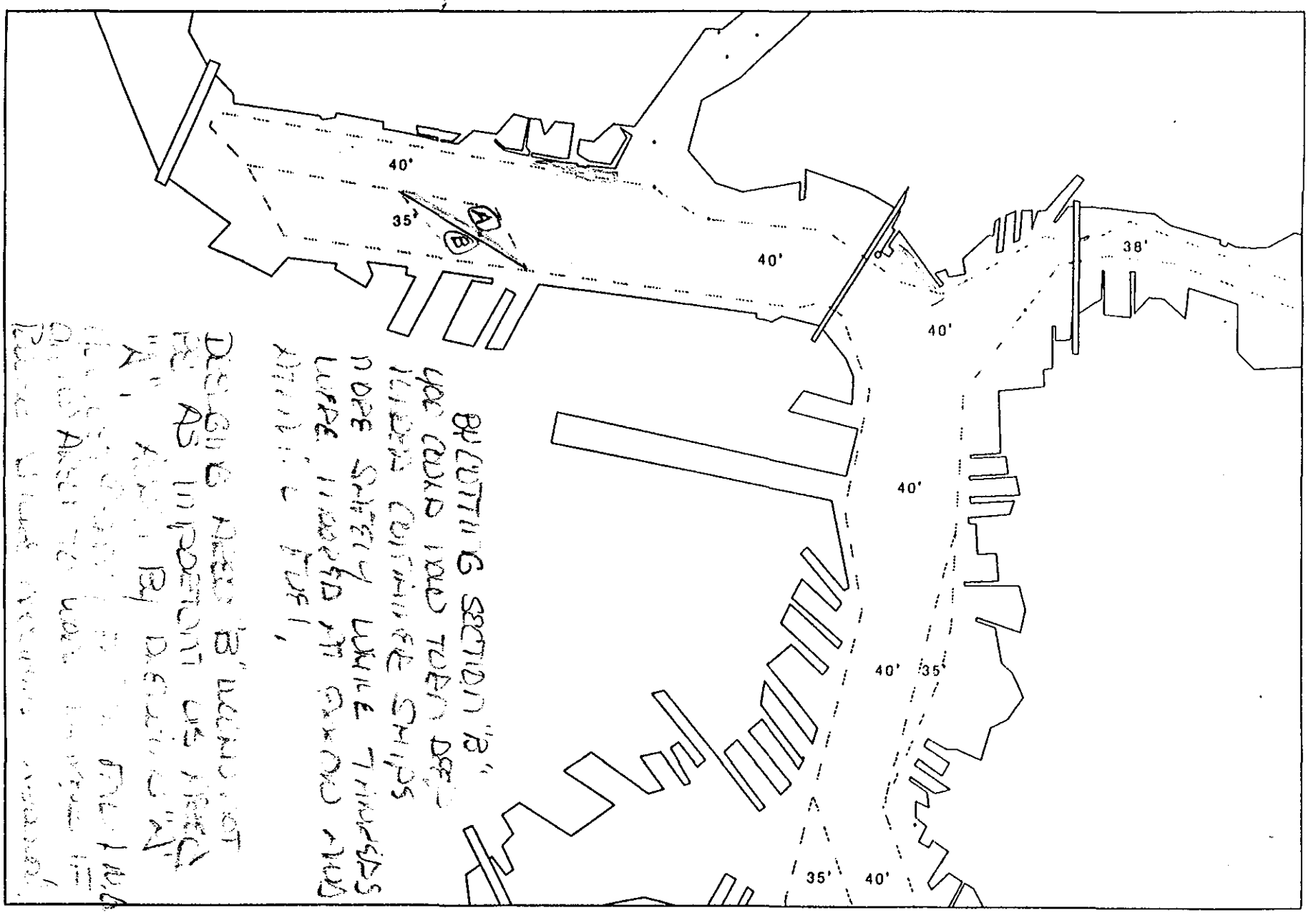


FIGURE 4 Plan 2 Configuration

BOSTON SIMULATION STUDY

Test Pilot Debriefing Form

Pilot # 3

If additional room is needed to answer any questions, please use the space provided at the end of this form or add extra sheets.

Background

1. How long have you been a Docking Master in the port of Boston?
   3 years

2. How many dockings/undockings have you made in the Mystic River?
   approximately 115 dockings/undockings in the last 12 months

3. How many dockings/undockings have you made in the Chelsea River lower reach?
   approximately 6 dockings/undockings in the last 12 months

   But remember that each transit of the river in & out of the upper reach you are transiting the lower branch also.

4. How many dockings/undockings have you made in the Chelsea River upper reach?
   approximately 39 dockings/undockings in the last 12 months

   Except shifting berths above Chelsea St. Bridge.

5. How many dockings/undockings have you made in the Reserved Channel?
   approximately 59 dockings/undockings in the last 12 months

Simulation Modeling

6. Did the simulated ship models listed below behave in a manner consistent with vessels of similar type, size, displacement and powering? If not, how did they differ?

Ship	Existing	Planned	
LNG DWT Tanker	38 ft.	42 ft.	I have never docked one of these!
50K DWT Tanker	38.5 ft.	42 ft.	
41K DWT Tanker	38 ft.	42 ft.	
87K DWT Tanker	38 ft.	45 ft.	
Panamax Container	36 ft.	40 ft.	I have never docked one of these!
APL C8 Container	34.5 ft.	40 ft.	I have never been aboard one of these vessels but I have piloted this size ships frequently.

Comments? 50K Tanker. In both loaded conditions I felt they did not respond to the rudder quite as well as I might of expected. Also when using ½ astern on one I think the would have backed much harder to port. I don't believe a 1600 hp. Tug could control the stern. 40K Tanker. This ship, in both loaded conditions seemed very realistic. But remember that this scenario is a lot closer to what we in Boston face on a day to day basis. The larger ships loaded to 42'-45' are heavier than we are used to dealing w.th. This could have a great effect on ... approved of their handling characteristics

★ 1600 hp tug at bow #1

7. How would you characterize the effect of the simulated currents on the test ships?

Flood	EBB
_ Much stronger than anticipated	_ Much stronger than anticipated
_ Stronger than anticipated	_ Stronger than anticipated
_ As anticipated	_ As anticipated
_ Weaker than anticipated	_ Weaker than anticipated
_ Much weaker than anticipated	_ Much weaker than anticipated

Comments? These cant be answered on an entire Boston Hbr. Basis so I will answer on an individual area basis.

See Note #2

8. How would you characterize the effect of the simulated tug boat forces?
   - _ Much stronger than anticipated
   - _ Stronger than anticipated
   - ✓ As anticipated
   - _ Weaker than anticipated
   - _ Much weaker than anticipated

Comments? Although I at times I was not happy about the effects of the Tugs I believe they were quite realistic. the use of a 1600 hp Tug to towhole

the stern of a 30K Tanker backing ½ on full is not possible. I believe the transient effects of the thruster would exhaust the power of the C.

9. How would you rate the overall realisim and accuracy of the simulation models?

- _ Very Good
- ✓ Good — Overall
- _ Adequate
- _ Poor
- _ Very Poor — But some aspects + areas were excellent!

10. Were there any characteristics of the simulation models that may have caused you or the simulated vessels to react in a manner different than what you would anticipate in the real world?

The lack of depth perception made me make my turns too early. None other than that.

11. Please use the space provided at the end of this form to suggest how the fidelity and utility of the Boston model can be improved.

Structured Simulation Test

12. Can the proposed channel configurations tested, safely and efficiently accommodate the test vessels used? Would you anticipate any operational restrictions? Please explain.

Mystic River (40 ft.) This area seemed quite safe for the proposed vessels. Except that the LNG Tanker needs a little more room between the proposed green can and the Exxon Ship.

Inner Confluence (40 ft.) This area is safer now except if they leave the 35' section as planned. If they dredge this area turning the bigger ships up into the Mystic river becomes a more difficult job definitely requiring the use of Tugs to make the turn. Once you use your tugs you lose the safety factor that you would like to have if some sort of emergency occured.

Chelsea River (38 ft.) I found no adverse effects in this area due to the dredging project. The only problem arises when they want you to maneuver a ship that is almost too big for the area. (Mobil - 50K Tanker - 42')

Reserved Channel (40 ft.) The test vessels can be maneuvered in this area but we have cut down on the margin of safety we're doing. Our ideas on how a specific job must be done may have to change. I worry that there is not much room for problems such as engine failure on the ships. The cut out area of the 35' side of the channel is barely large enough and isn't it there is no room for extra maneuvers.

13. Would you recommend any changes to the channel configurations or aids to navigation scheme to better accommodate these vessels? (please mark-up the attached diagrams)

_ No

X Yes - Please explain

See notes on attached diagram

14. Do you feel that the Inner Confluence area needs to be widened as in the "planned configuration"

_ No

✓ Yes - Please explain

I believe the proposed jobs can be done under the planned configuration however you cut down considerably the safety of the job. No longer can you steer this ship around the corner. You will have to use tugs to perform the maneuver. It needs to be widened as in planned conf. #2 to add some safety to the job.

15. Do you feel that the configuration in "plan 2" is required?

(Dredging of the 35' side of the Main Ship Channel to 40', downstream of the Inner Confluence)

_ No

✓ Yes - Please explain

As explained above.

16. Are there other situations in the real world that would be considered more severe scenarios than the "worst case" scenarios we have tested?

_ No

✓ Yes - Please explain

Any time you have some kind of equipment failure. As far as the current is concerned the simulation has created a worse case scenario. Obviously the wild card is human error affecting the job.

20. Please use the attached sheets and diagrams to comment on any aspect of this study.

Thank you!

#11) The simulations were excellent. The only item I would suggest would be to lift the side view when going through the Chelsea St. Bridge to make the clearance between the ship and the bridge a little easier to see

Brian

I enjoyed working with you. If I can ever be of assistance with this or other projects let me know. Also if you come to Boston please drop in and go for a ride.

Ernest

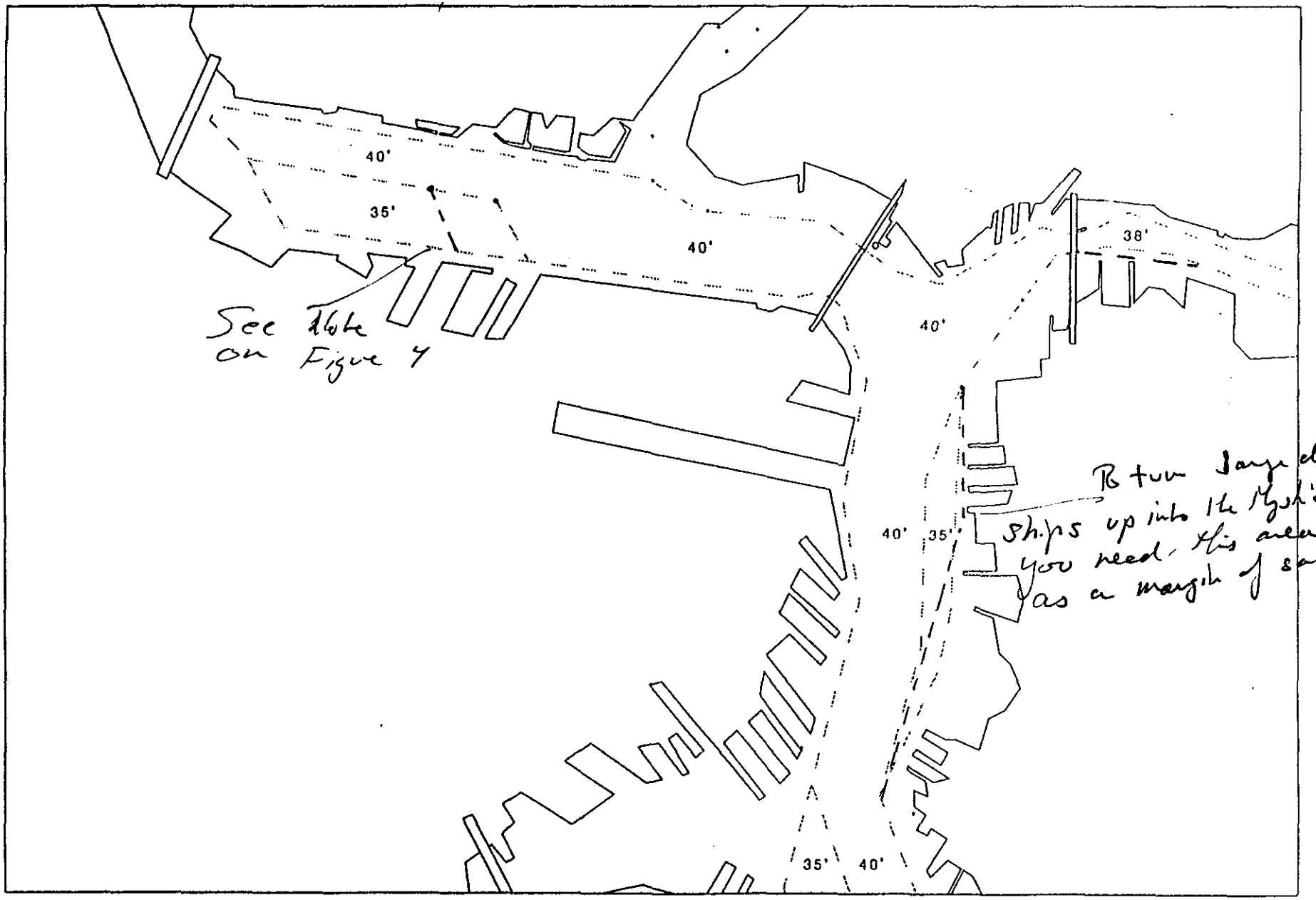


FIGURE 3 Planned Configuration - sheet 1 of 3

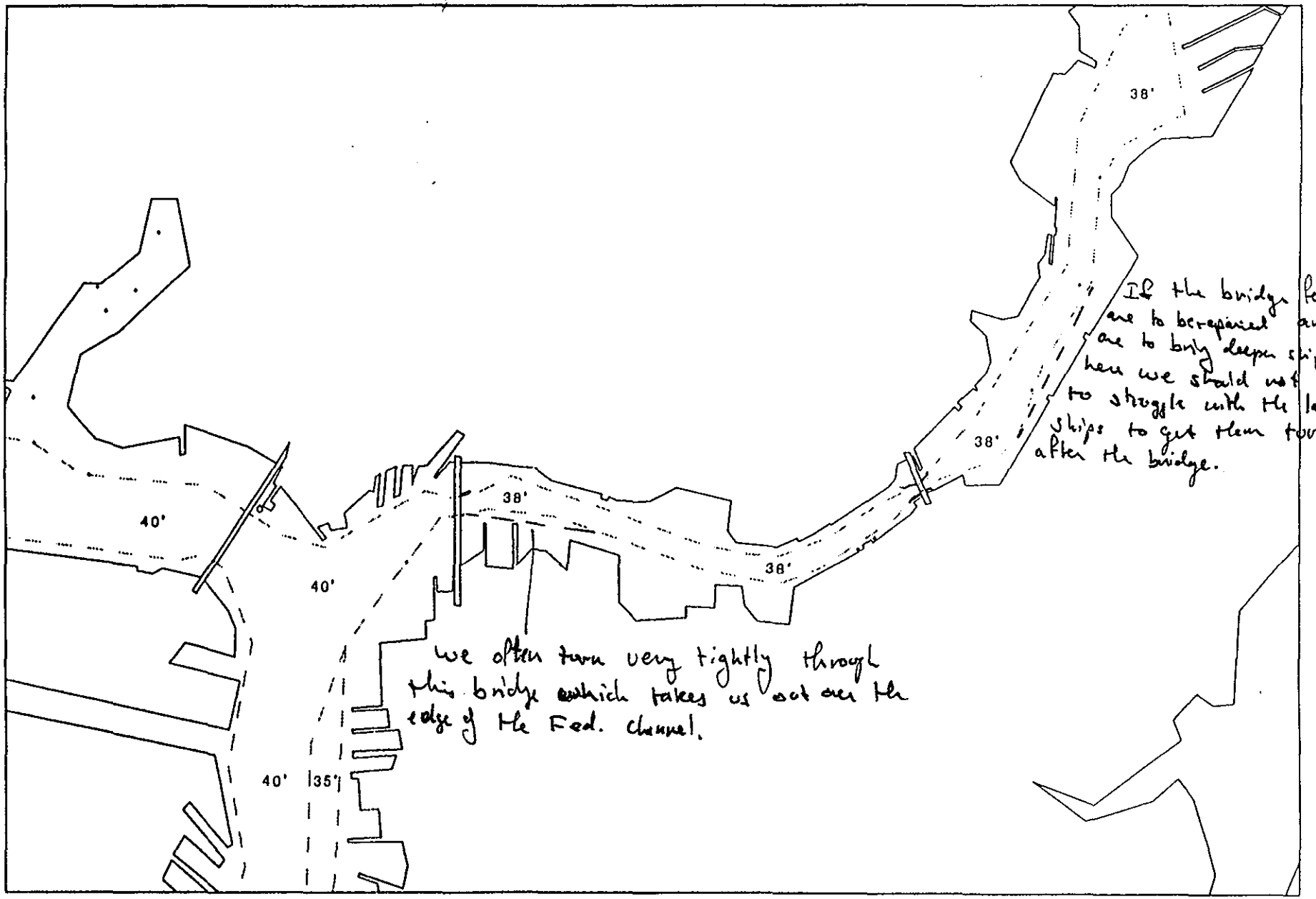


FIGURE 3 Planned Configuration - sheet 2 of 3

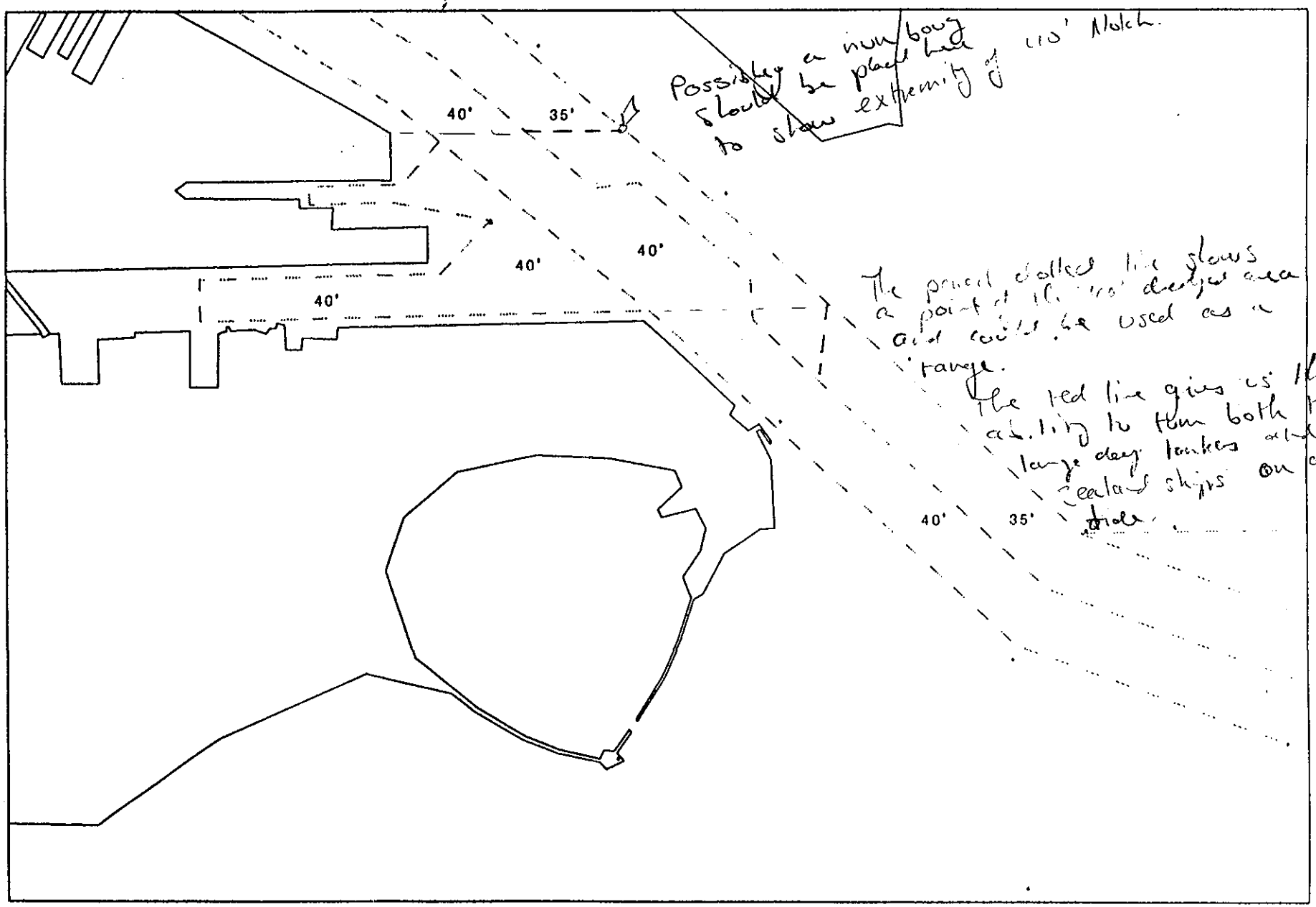


FIGURE 3 Planned Configuration sheet 3 of 3

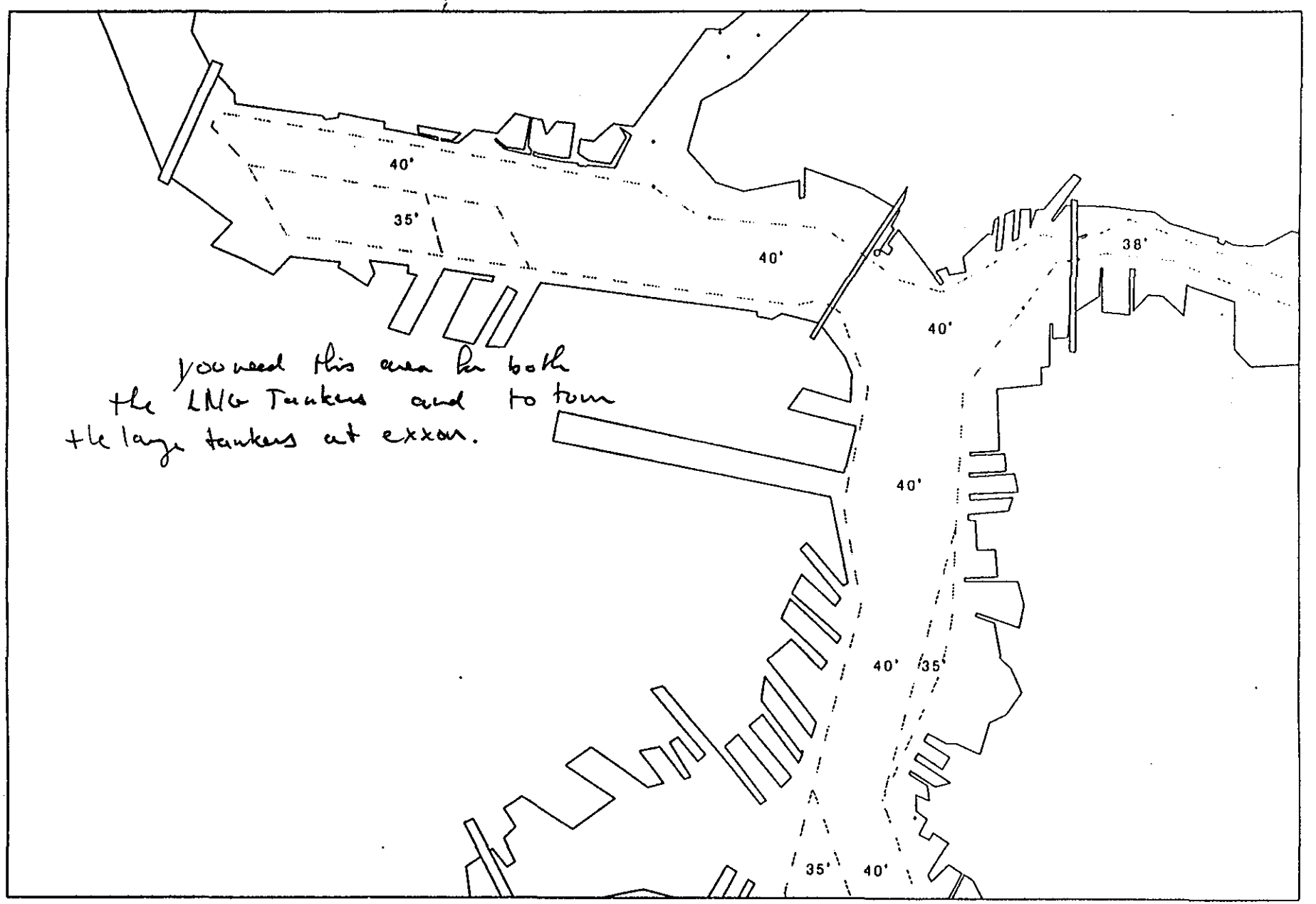


FIGURE 4 Plan 2 Configuration

Notes.

#1) Part 6) [redacted] Tanker This ship seemed very realistic except that I believe at 45° they would have been harder to stop. As I went into these simulations I was concerned about their stopping (backing) a.s.i. it's at these drafts. However they stopped a lot easier than I thought they would. # Once again remember we do not see 800' Tankers docked to 45'. But I have had the opportunity to watch this size ship dock in another port and they do not stop quickly while trying to keep them under control.

[redacted] This ship seemed a little sluggish with respect to the rudder Power. Although I do admit when I'd thrust the bow she responded well. Maybe this was due to the flood Tide on the stb. Bow while passing under the Mystic River Bridge.

Note #2 Chelsea River: The flood + E66 currents were as anticipated. I did not feel any adverse effects of the current except maybe a little in the turning basin it seemed a little stronger than in actuality.

Continued on page 2.

Note 2 continued Mystic River: The currents here were as anticipated. I did not feel anything out of the ordinary. In analizing my CB Contact Log at Moran I am not sure why my bow was so tight. As I said earlier maybe it was due to the flood tide on the 8th bow having an effect through the first half of the run, then as my bow came into the current its effects died off but I still kept the rudder to the right which put me further to the right than I wanted. If this was so then I think the current would have been stronger than anticipated but I am not sure this is the reason for the extra right turn. (I hope this makes sense)

Reserved Channel: In this area I felt the currents, both Flood + Ebb, were stronger than anticipated. Ebb Tide the current seemed much stronger than anything I have seen before. 1180 it extended into the Reserved Channel further than I've seen it before. Could this be because of the effects of the dredging project? Maybe.

Flood Tide: The flood tide scenerio's were difficult. Even though the wind was opposite to the current the effects of tide were tremendous. (In thinking about it maybe my comments about the wind being stronger than it's were wrong. Possibly it was just that

Move 2 continued. the current effects are tremendous in this area. We must take into account the effects this dredging project will have on the direction and flow of tidal current in this area. Could the deeper half of the channel actually attract a disproportionately greater share of this current? If so then it will effect our ability to do these jobs. —— Usually when I have backed a ship's stern in past the end of the castle on a flood tide, the effects of the current on the after part of the ship would decrease quickly. They did not in any of the flood tide scenarios.

Instead of attempting to blame the simulator for effects that I was not used to I think a more realistic approach is to realize that these scenarios, even the present plan scenarios, are set up with job characteristics that are different than ordinary. I think the effects of the tide are due mostly to the deep draft conditions and the bottom characteristics of the dredging. (Once again I hope this makes sense.)

BOSTON SIMULATION STUDY

Test Pilot Debriefing Form

Pilot # 4

If additional room is needed to answer any questions, please use the space provided at the end of this form or add extra sheets.

Background

1. How long have you been a Docking Master in the port of Boston?
   25 years approx 5000 ships Chelsea creek, Mystic River, Reserve channel, Quincy, Braintree, Town River, Salem etc
2. How many dockings/undockings have you made in the Mystic River?
   approximately 0 dockings/undockings in the last 12 months

3. How many dockings/undockings have you made in the Chelsea River lower reach?
   approximately 0 dockings/undockings in the last 12 months

4. How many dockings/undockings have you made in the Chelsea River upper reach?
   approximately 0 dockings/undockings in the last 12 months

5. How many dockings/undockings have you made in the Reserved Channel?
   approximately 0 dockings/undockings in the last 12 months

Simulation Modeling

6. Did the simulated ship models listed below behave in a manner consistent with vessels of similar type, size, displacement and powering? If not, how did they differ? All vessels reacted approx the same as I have experienced

Ship	Existing	Planned
LNG DWT Tanker	38 ft.	42 ft.
50K DWT Tanker	38.5 ft.	42 ft.
41K DWT Tanker	38 ft.	42 ft.
87K DWT Tanker	38 ft.	45 ft.
Panamax Container	36 ft.	40 ft.
APL C8 Container	34.5 ft.	40 ft.

Comments? Cushioning + suction effects of displaced water due to ships was not to distinct appear on simulations, seems especially in Chelsea Creek at times

7. How would you characterize the effect of the simulated currents on the test ships?

Flood	Ebb
_ Much stronger than anticipated	✓ Much stronger than anticipated
_ Stronger than anticipated	_ Stronger than anticipated
✓ As anticipated	_ As anticipated
_ Weaker than anticipated	_ Weaker than anticipated
_ Much weaker than anticipated	_ Much weaker than anticipated

Comments? Mostly on large tankers + Container ships backing out Reserve channel

8. How would you characterize the effect of the simulated tug boat forces?

_ Much stronger than anticipated

_ Stronger than anticipated

_ As anticipated

✓ Weaker than anticipated

_ Much weaker than anticipated

Comments? On large tankers + Container ships backing out Reserve channel.

9. How would you rate the overall realisim and accuracy of the simulation models?

- _ Very Good
- _ Good
- _ Adequate
- ↙ Poor
- _ Very Poor

visual view on screen & overhead view on monitor not synchronized

10. Were there any characteristics of the simulation models that may have caused you or the simulated vessels to react in a manner different than what you would anticipate in the real world?

Yes - Visual view seemed to be off in depth perception

11. Please use the space provided at the end of this form to suggest how the fidelity and utility of the Boston model can be improved.

Structured Simulation Test

12. Can the proposed channel configurations tested, safely and efficiently accommodate the test vessels used? Would you anticipate any operational restrictions? Please explain.

Mystic River (40 ft.) Yes - no problem

Inner Confluence (40 ft.) _____

Chelsea River (38 ft.) Yes but limited to 660 x 90' ships

Reserved Channel (40 ft.) Yes No problem

13. Would you recommend any changes to the channel configurations or aids to navigation scheme to better accommodate these vessels? (please mark-up the attached diagrams)

_ No

✓ Yes - Please explain

Figure 3 Sheet 1 of 3 Num off of Chelsea Navy Hosp should be lighted

R Lt buoy 10 should be retained - important for Reserve channel in + out at night -
Corner of Cutoff Bth 15 + 16 should have 2 more R/G lights to mark end of dock - very important going in or out at night. Discontinue

14. Do you feel that the Inner Confluence area needs to be widened as in the "planned configuration"

_ No

✓ Yes - Please explain

More room to make easier turns especially large tankers going into the Mystic River - More room to maneuver if ship takes a skew

15. Do you feel that the configuration in "plan 2" is required?
(Dredging of the 35' side of the Main Ship Channel to 40', downstream of the Inner Confluence)

_ No

✓ Yes - Please explain

the shoal off of EB at the entrance to McArdle bridge should be removed for the benefit of the LNG tankers + for the suction effects it would have on tankers going up the creek

16. Are there other situations in the real world that would be considered more severe scenarios than the "worst case" scenarios we have tested?

_ No

✓ Yes - Please explain

Protection of Tobin Bridge abutment on Chelsea side

20. Please use the attached sheets and diagrams to comment on any aspect of this study.

Thank you!

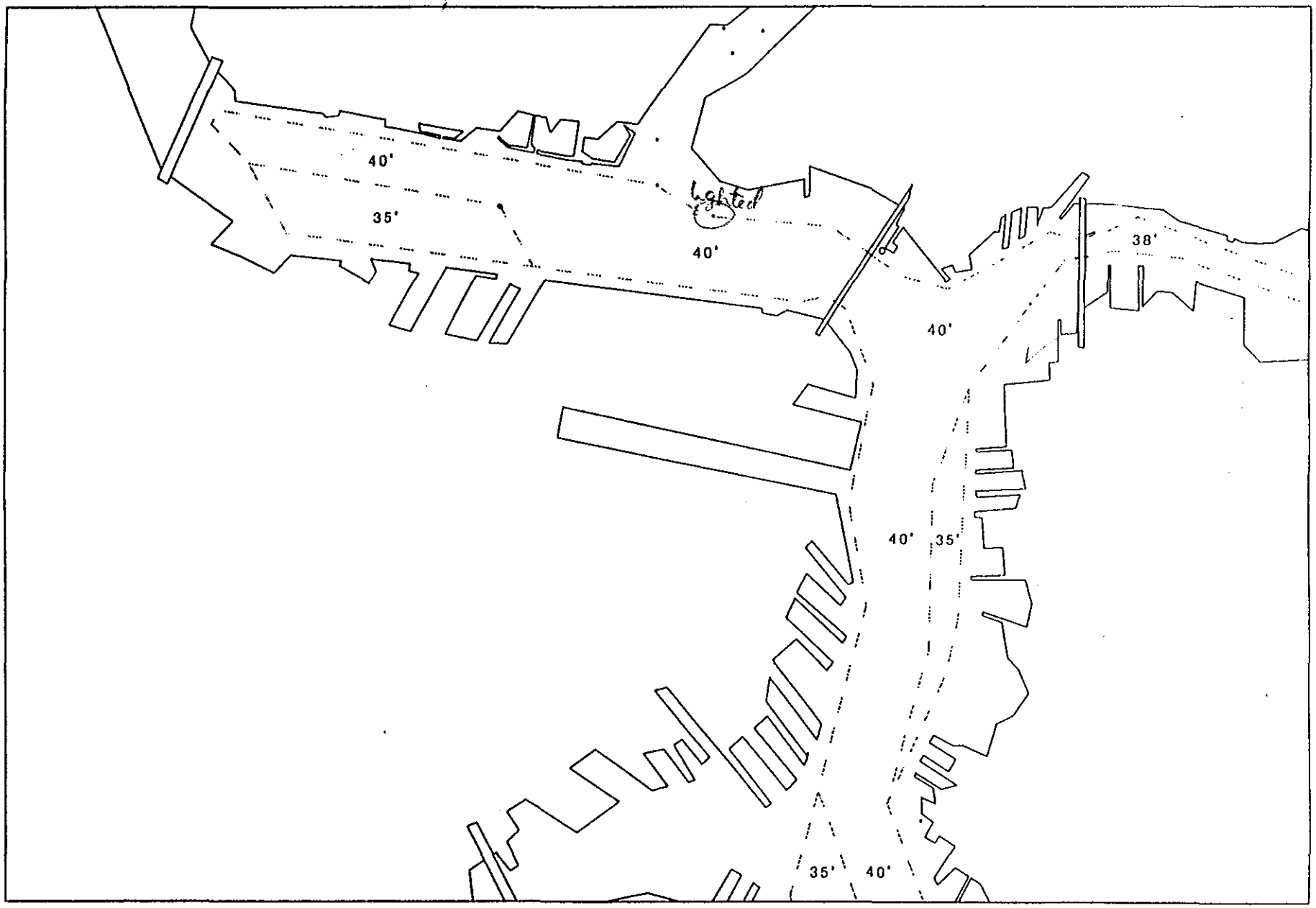


FIGURE 3 Planned Configuration - sheet 1 of 3

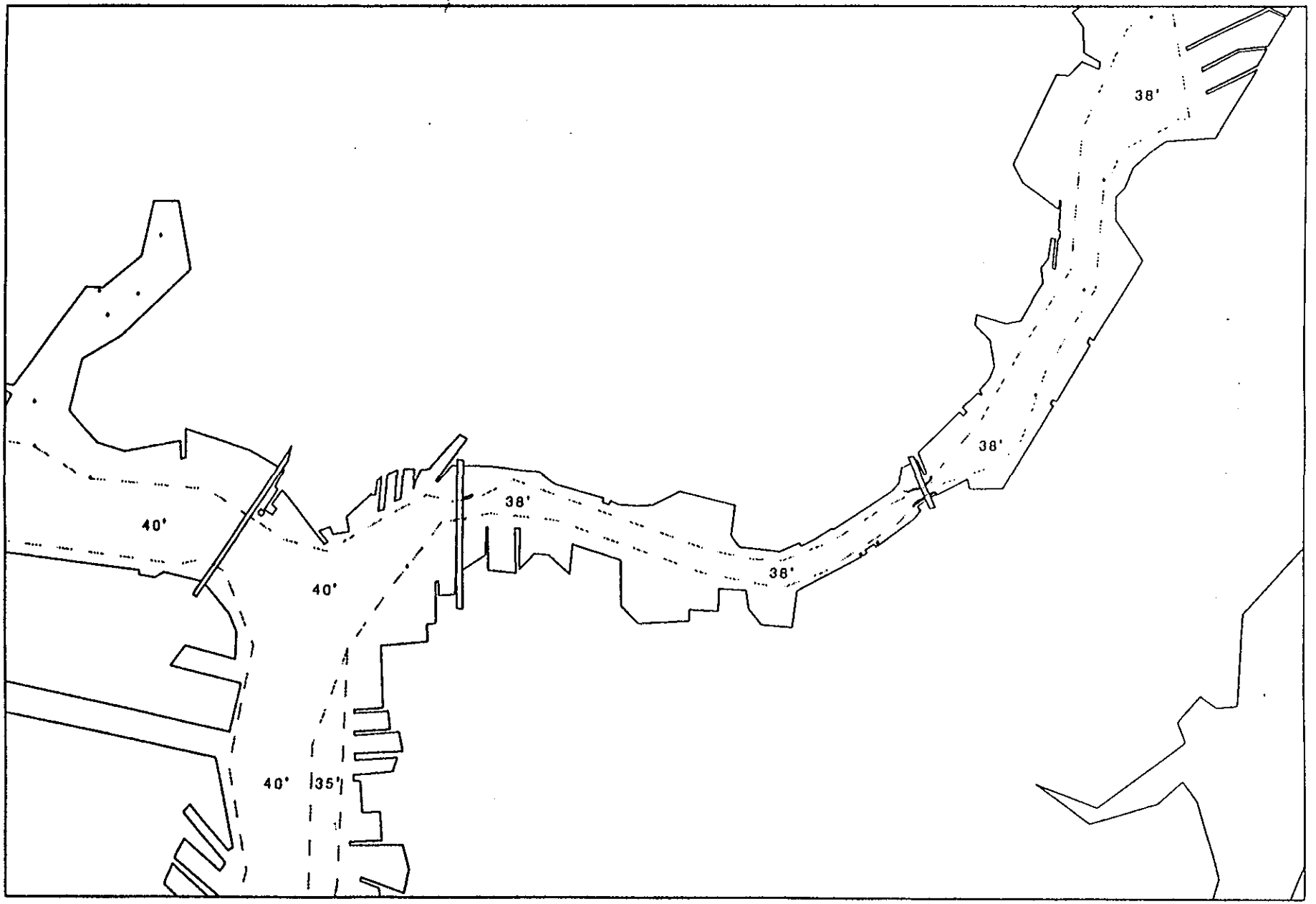


FIGURE 3 Planned Configuration - sheet 2 of 3

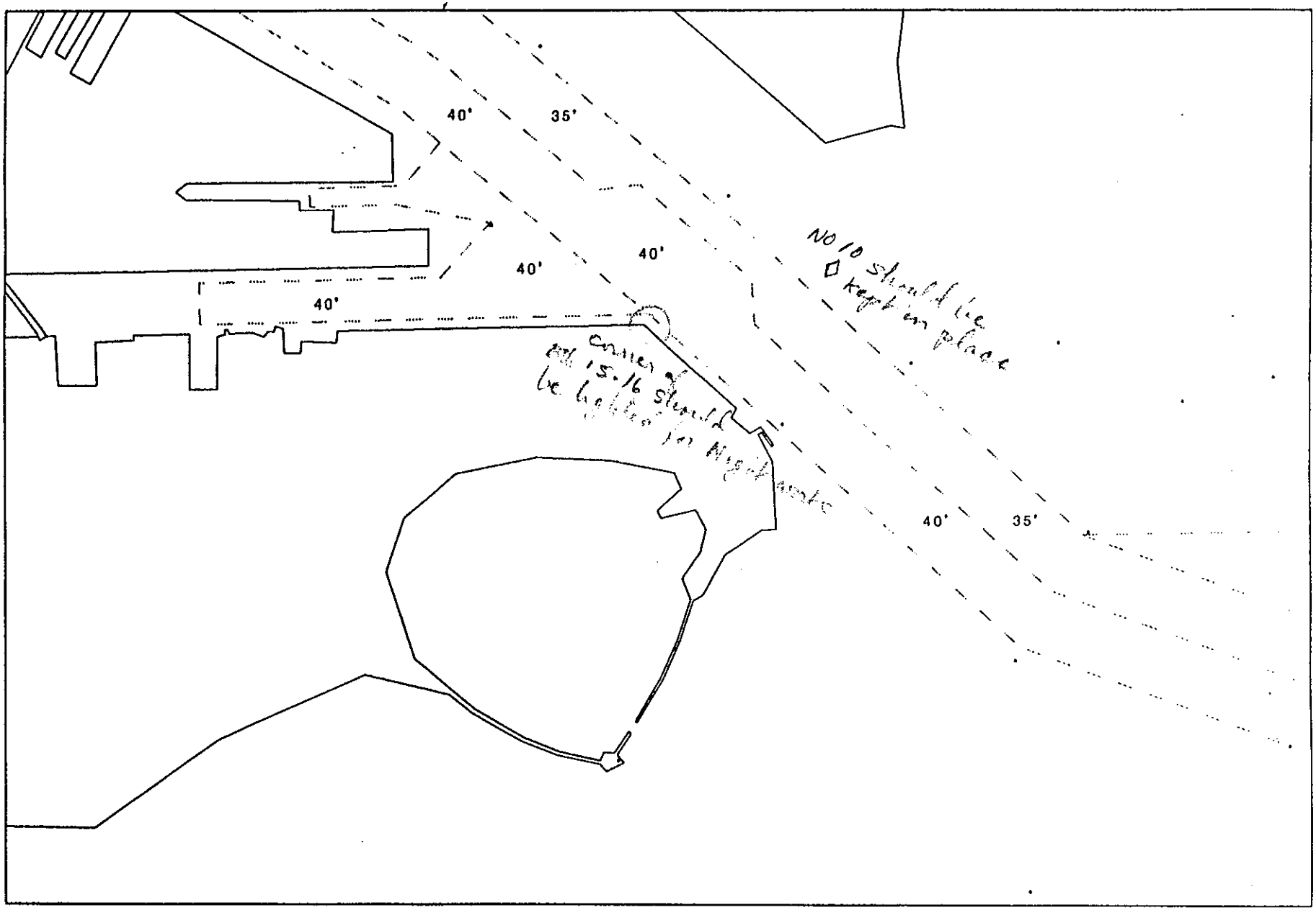


FIGURE 3 Planned Configuration sheet 3 of 3

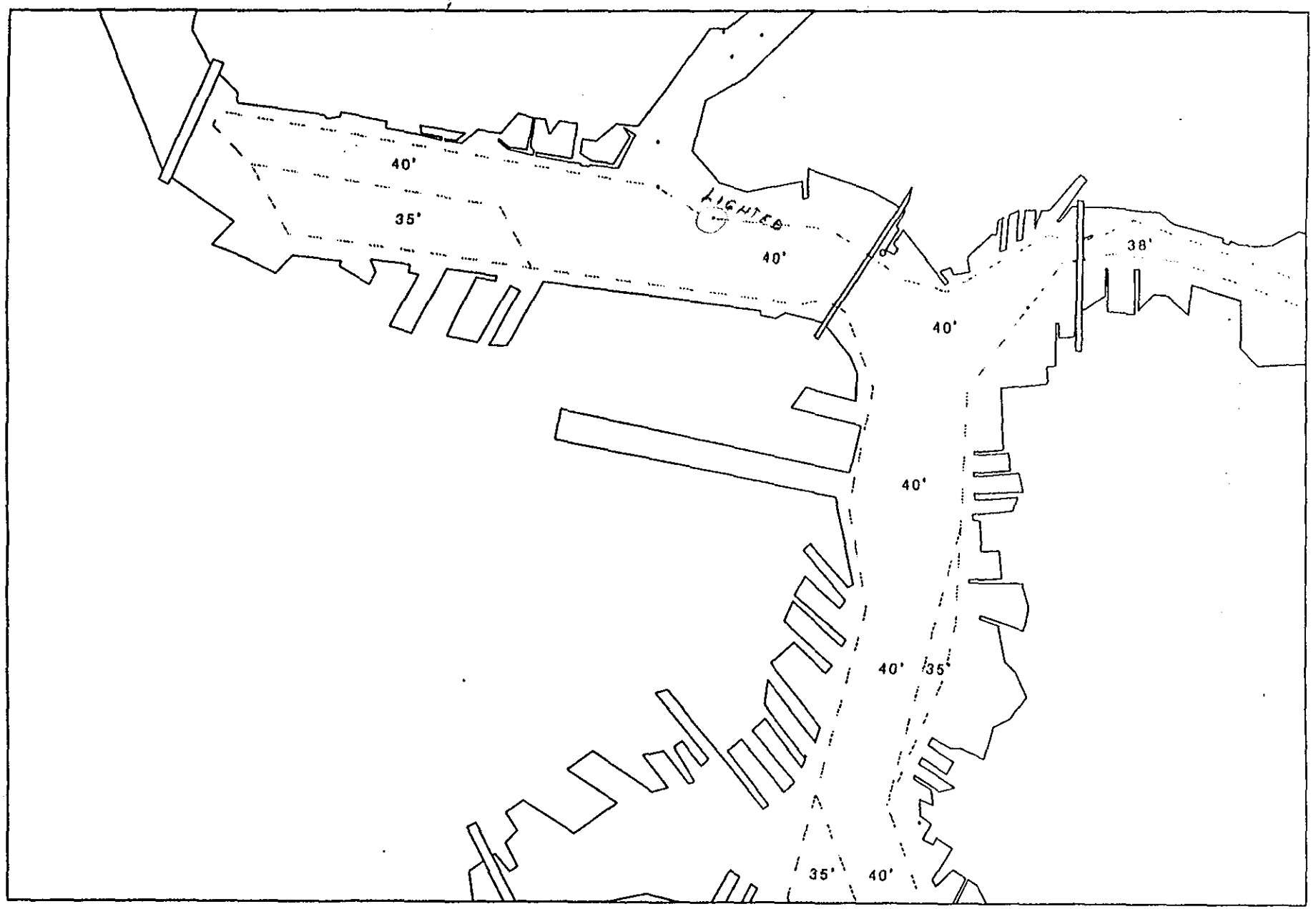


FIGURE 4 Plan 2 Configuration

BOSTON SIMULATION STUDY

Test Pilot Debriefing Form

Pilot # 5

If additional room is needed to answer any questions, please use the space provided at the end of this form or add extra sheets.

Background

1. How long have you been a Docking Master in the port of Boston?
   14 years

2. How many dockings/undockings have you made in the Mystic River?
   approximately 40 dockings/undockings in the last 12 months

3. How many dockings/undockings have you made in the Chelsea River lower reach?
   approximately 10 dockings/undockings in the last 12 months

4. How many dockings/undockings have you made in the Chelsea River upper reach?
   approximately 100 dockings/undockings in the last 12 months

5. How many dockings/undockings have you made in the Reserved Channel?
   approximately 40 dockings/undockings in the last 12 months

Simulation Modeling

6. Did the simulated ship models listed below behave in a manner consistent with vessels of similar type, size, displacement and powering? If not, how did they differ?

Ship	Existing	Planned
LNG DWT Tanker	38 ft. YES	42 ft. YES
50K DWT Tanker	38.5 ft. YES	42 ft. YES
41K DWT Tanker	38 ft. YES	42 ft. YES
87K DWT Tanker	38 ft. YES	45 ft. YES
Panamax Container	36 ft. YES	40 ft. YES
APL C8 Container	34.5 ft. YES	40 ft. YES

Comments ?_____

7. How would you characterize the effect of the simulated currents on the test ships?

Flood	EBB
✓ Much stronger than anticipated	_ Much stronger than anticipated
_ Stronger than anticipated	✓ Stronger than anticipated ? ? ?
_ As anticipated	_ As anticipated
_ Weaker than anticipated	_ Weaker than anticipated
_ Much weaker than anticipated	_ Much weaker than anticipated

Comments? FLOOD: REFERS to RESERVE CHANNEL ENTRANCE

EBB - Combined forces of wind and current were much stronger than anticipated, as we discussed at the time. Could have been incorrect wind effect

8. How would you characterize the effect of the simulated tug boat forces?

- _ Much stronger than anticipated
- ✓ Stronger than anticipated
- _ As anticipated
- ✓ Weaker than anticipated
- _ Much weaker than anticipated

Comments? (1) Somewhat stronger in Pulling ECON ship off the dock. (2) Either fresh tugs or strong wind + tide or combination of these off end of army base + Reserve Channel when docking

9. How would you rate the overall realisim and accuracy of the simulation models?

- ✓ Very Good
- _ Good
- _ Adequate
- _ Poor
- _ Very Poor

except at Chelsea Street bridge, where it was Poor, and except as already noted in previous comments

10. Were there any characteristics of the simulation models that may have caused you or the simulated vessels to react in a manner different than what you would anticipate in the real world?

Mainly, a consistent tendency to stop a ship short of where I wanted to due to objects seeming to be closer than they really were. Overhead views were very helpful, but did not overcome this problem.

11. Please use the space provided at the end of this form to suggest how the fidelity and utility of the Boston model can be improved.

Structured Simulation Test

12. Can the proposed channel configurations tested, safely and efficiently accommodate the test vessels used? Would you anticipate any operational restrictions? Please explain.

Mystic River (40 ft.) The 35' ft area at SW of project that will not be maintained needs to have the corner cut off more so as not to force LNG tankers into such close proximity to EXXON. It is too dangerous, creating a new hazard where none previously existed

Forcing the tugs to work that close to EXXON has caused problems before - tug wake was alleged to have caused damage to booms and boats, floats, etc. NOT GOOD AS DESIGNED.

Inner Confluence (40 ft.) OK

Chelsea River (38 ft.) SAFELY & EFFICIENTLY? NO! at least, not in the case of 50K ships. Ships is too big (DISPL.) and too heavy to operate safely here. Marginal, at best, if every thing goes right.

41K ships was not modelled correctly during approach and passage thru bridge, so simulation can reach no conclusion on this because bridge is key to whole transit. BANK CUSHION AND SUCTION WERE NOT NOTICEABLE IN SIMULATION, and are very much in evidence in real world.

~~Reserve Channel (40 ft.)~~ RESERVE CHANNEL: NEW CONFIGURATION OK but required radically different approach to turn when docking Navy wharf

* Sailing at 36+ draft near low water tricky due to chance of crossing over invisible ledge into 35 FT side.

13. Would you recommend any changes to the channel configurations or aids to navigation scheme to better accommodate these vessels? (please mark-up the attached diagrams)

_ No

✓ Yes - Please explain

Also, docking - new config. - heading deep into area off end of army B. We need to begin left turn from red side of main channel as done in simulation runs. THIS DEMONSTRATES A NEED TO INCREASE WIDTH OF 40' CHANNEL OFF CASTLE IS. PIER

Also leave main chan. Std. buoy #10 in present posit. We use it in + out of Reserve Channel for steering ref. MYSTIC RIVER - Cut off corner of 35 ft area to give LNG more room - don't need too much more to make it safe. Even buoy to mark 35' area unacceptable - it is right in middle of river and VERY MUCH IN THE WAY. USE A RANGE

14. Do you feel that the Inner Confluence area needs to be widened as in the "planned configuration"

_ No

✓ Yes - Please explain A good idea if heavier + deeper LNGs and tankers are contemplated. Also benefits deep ships approaching MacArdle bridge by removing or lessening danger of bank suction on starboard side. Also improves entry and egress from Atlantic docks.

15. Do you feel that the configuration in "plan 2" is required?

(Dredging of the 35' side of the Main Ship Channel to 40', downstream of the Inner Confluence)

_ No

X Yes - Please explain

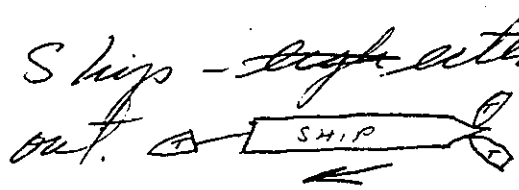
YES - definitely required for making turn under Mystic Viaduct w/ deep loaded ships - We need to initiate that turn from as close to the E. Boston side of the channel as we can, in order to make a wide-radius turn. Holding to mid-channel (90') means inbound ships must make very sharp left turn - perhaps too sharp!

16. Are there other situations in the real world that would be considered more severe scenarios than the "worst case" scenarios we have tested?

_ No

X Yes - Please explain

CHELSEA CREEK - All testing with an eye to introducing larger & deeper ships totally ignores the problem of getting these ships back down the Creek after discharge. LOWER REACH: Ships need to be backed out stern-first, a difficult job in a 660 x 90, let alone 679 x 106!! The creek is not properly wide enough to accomodate the ends of the

Ships - both either going in or, especially out. 

Tugs used to stern ship stern-first need room as low swings at Cabots + McArdle Bridge

20. Please use the attached sheets and diagrams to comment on any aspect of this study.

Thank you!

One important point that must be made with reference to the track charts printed out after each simulation:

While there is now conclusive evidence where the ships were at any point in time, they do not show at all, either their indicating rudder position WHAT EXTERNAL TUG FORCES WERE NEEDED, OR WHAT ENGINE ORDERS WERE NEEDED to produce the observable result i.e., how much RESERVE CONTROL remained during the maneuver.

Some maneuvers required max. control to be used leaving 0 Reserve control, namely, ① the 87K entering Mystic in planned config. w/ 35' draft left as is. ② 50K in lower reach under all conditions, especially 42' draft. ③ ECON SHIP at less draft leaving both - planned config - needed tugs to make turn into main channel.

Any maneuver, in my experience, that requires maximum tug and ship power to get through is one that ROUTINELY cannot be expected to be successful 100% over a period of time - it is somewhat like Russian roulette.

Sure, any job may need all the horses once in a while, but if the need is frequent, the (OVER)

maneuver ~~must~~ must be considered UNSAFE. A .900 average might be utopian in baseball, but it is most assuredly unacceptable when handling ocean-going ships.

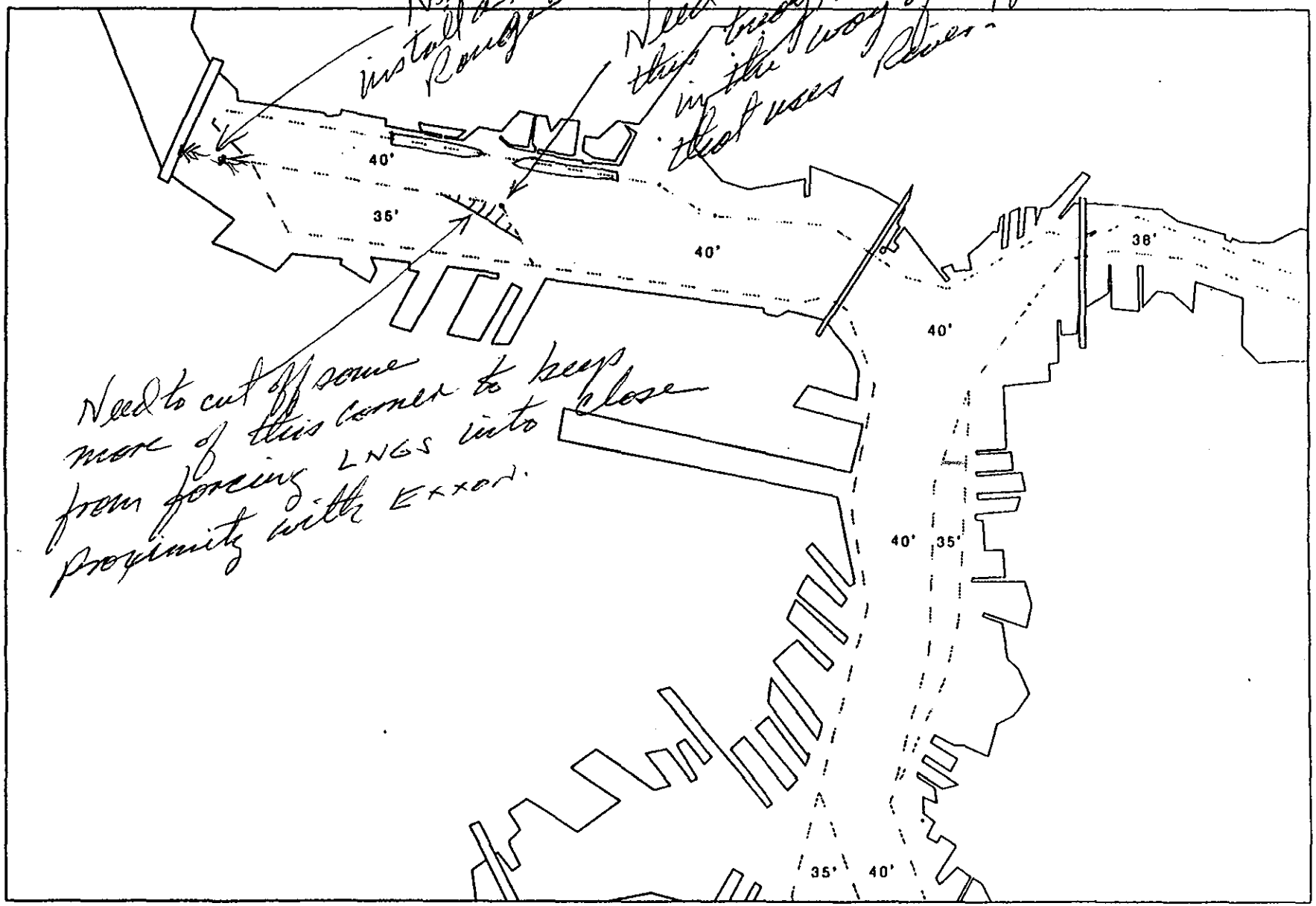


FIGURE 3 Planned Configuration - sheet 1 of 3

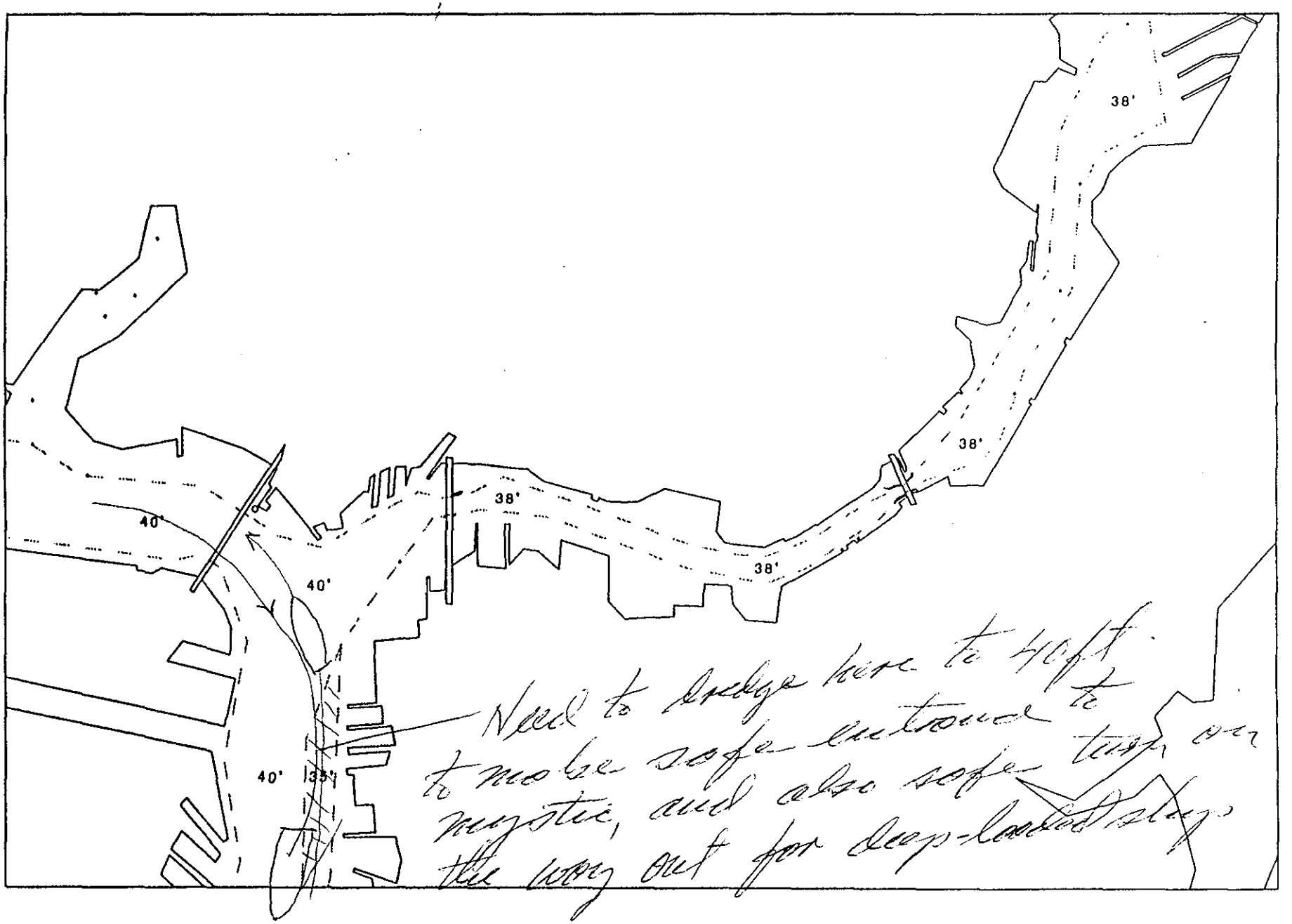


FIGURE 3 Planned Configuration - sheet 2 of 3

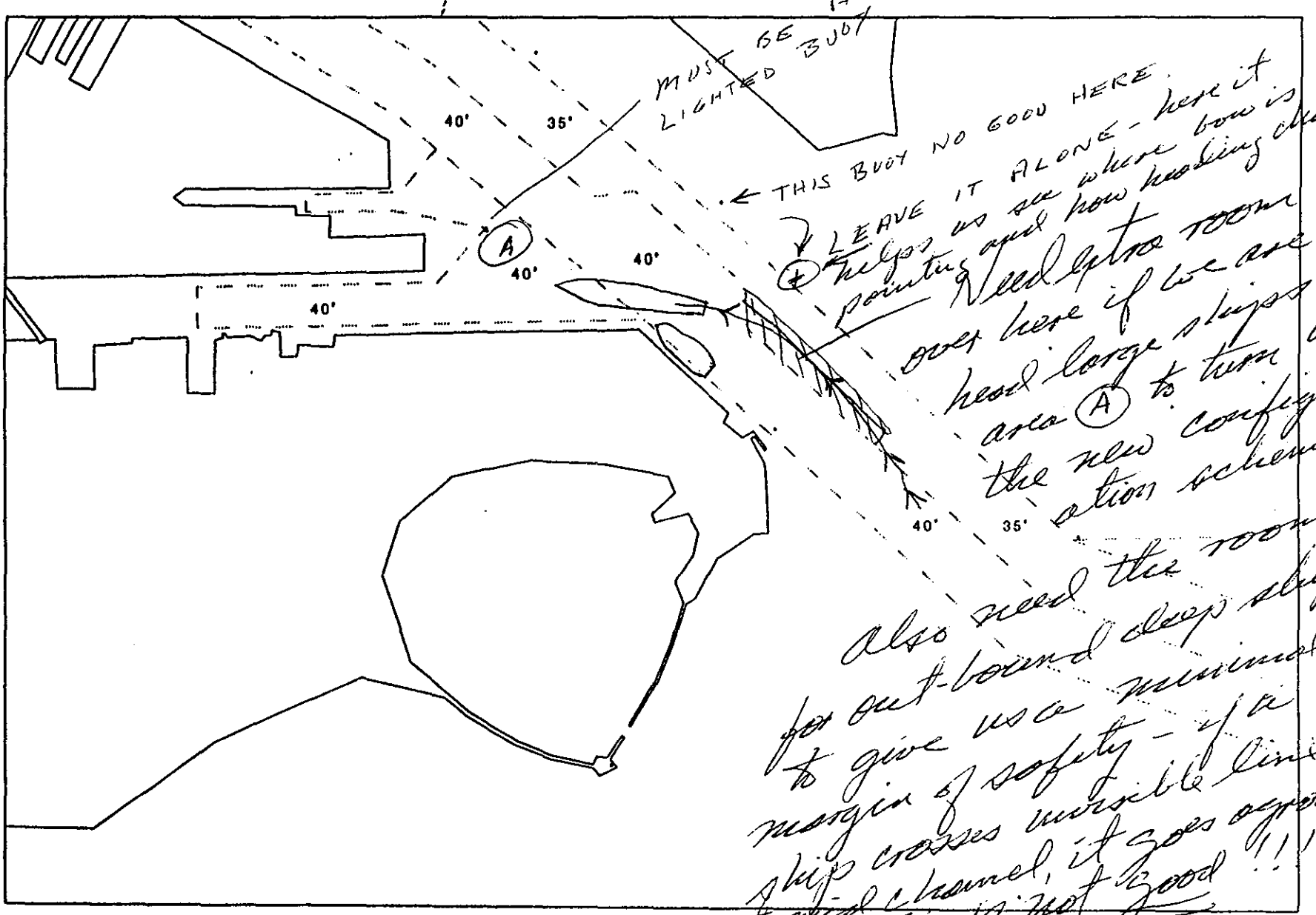


FIGURE 3 Planned Configuration sheet 3 of 3

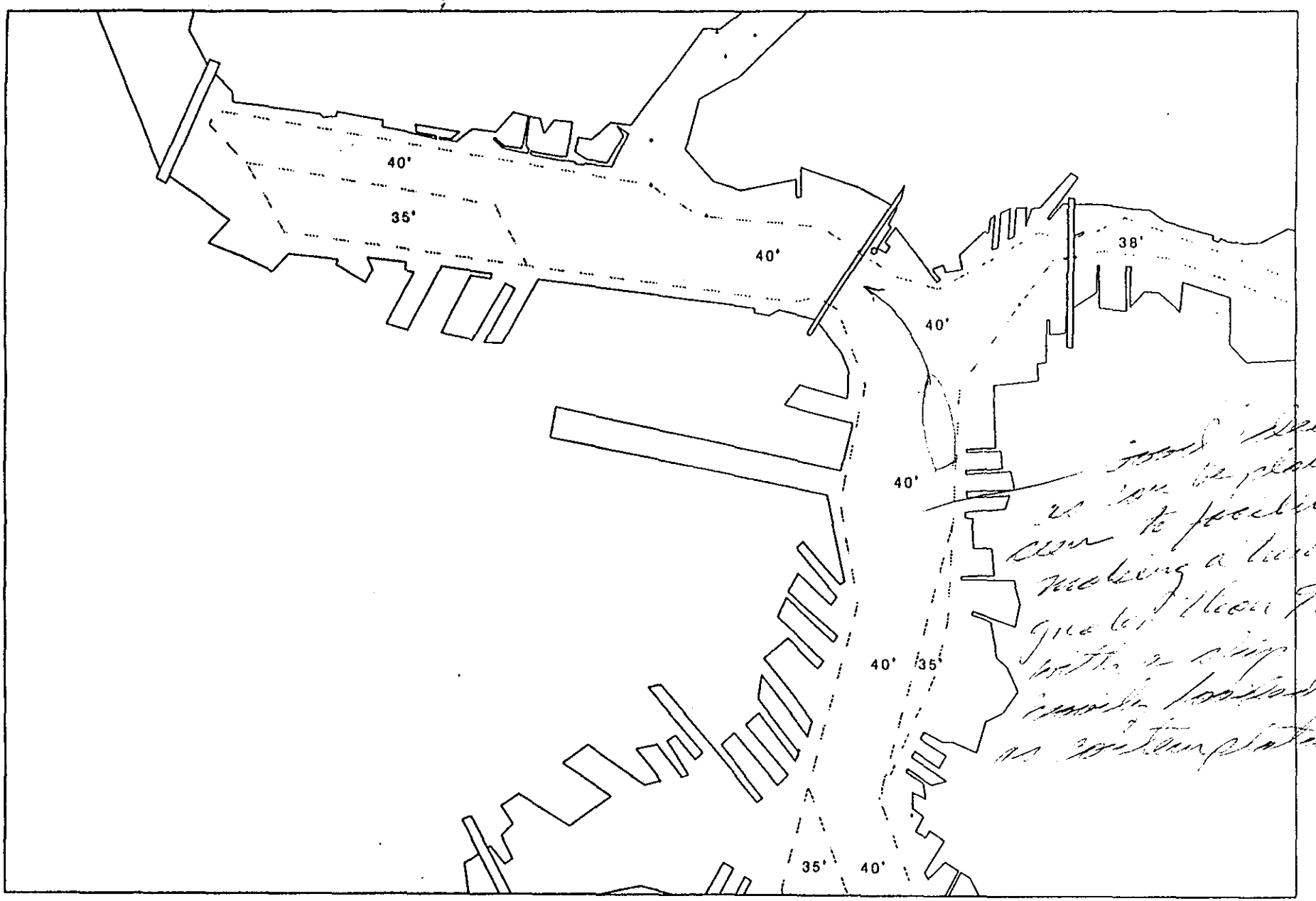


FIGURE 4 Plan 2 Configuration

APPENDIX G

Test Vessel Characteristics

TABLE G-1 Characteristics of Ship Models

VESSEL TYPE	LENGTH (ft)	BEAM (ft)	STATIC DRAFT EXISTING (ft)	STATIC DRAFT PROPOSED (ft)
LNG	940	140	38	42
50K DWT Tanker	692	106	38.5	42
41K DWT Tanker	585	90	38	42
87K DWT Tanker	840	138	38	45
Panamax Container	950	106	36	40
APL C8 Container	788	100	34.5	40

(111) 125K m3 LNG MIRANA 42' DRAFT

FOR MSI INSTRUCTIONAL PURPOSES ONLY

COMMAND	KNOTS	RPM
FULL SEA SPEED	19.1	120
FULL SPEED	11.2	70
HALF AHEAD	8.0	50
SLOW AHEAD	6.4	40
DEAD SLOW AHEAD	3.2	20
STOP	0	0
DEAD SLOW ASTERN		-20
SLOW ASTERN		-30
HALF ASTERN		-45
FULL ASTERN		-60

NOTE:
LOA	940 FT.
BEAM	140 FT.
DRAFT	42 FT.
DISP.	114,000
ENG.	21,600 HP

UPDATED: 20 MAR.92

(112) 50K TANKER 42'DRAFT

FOR MSI INSTRUCTIONAL PURPOSES ONLY

COMMAND	KNOTS	RPM
FULL SEA SPEED	16.4	90
FULL AHEAD	14.6	80
HALF AHEAD	10.9	60
SLOW AHEAD	7.3	40
DEAD SLOW AHEAD	3.6	20
STOP	0	0
DEAD SLOW ASTERN		-10
SLOW ASTERN		-20
HALF ASTERN		-30
FULL ASTERN		-50

NOTE:
LOA	692 FT.
BEAM	106 FT.
DRAFT	42 FT.
DISP.	67,000
ENG.	17,000 HP

UPDATE: 20 MAR 92

(114) 41K TANKER CHALSEA QUEEN 42'DRAFT

FOR MSI INSTRUCTIONAL PURPOSES ONLY

COMMAND	KNOTS	RPM
FULL SEA SPEED	15.6	150
FULL AHEAD	14.6	140
HALF AHEAD	7.3	70
SOLW AHEAD	5.2	50
DEAD SLOW AHEAD	3.7	35
STOP	0	0

==========

DEAD SLOW ASTERN	-35
SLOW ASTERN	-50
HALF ASTERN	-70
FULL ASTERN	-105

NOTE: LOA 585 FT.
BEAM 90 FT.
DRAFT 42 FT.
DISP. 48,000 LT.
ENG. 14,000 HP

UPDATED: 20 MAR. 92

(116) 87K TANKER MYSTIC 45' DRAFT

FOR MSI INSTRUCTIONAL PURPOSES ONLY

COMMAND	KNOTS	RPM
FULL SEA SPEED	15.5	90
FULL AHEAD	10.7	68
HALF AHEAD	8.9	53
SLOW AHEAD	7.3	42
DEAD SLOW AHEAD	3.9	30
STOP	0	0

==========

DEAD SLOW ASTERN	-30
SLOW ASTERN	-40
HALF ASTERN	-60
FULL ASTERN	-70

NOTE:
LOA 840 FT.
BEAM 138 FT.
DRAFT 45 FT.
DISP. 115,000
ENG. 20,500 HP

UPDATED: 20 MAR.92

(117) ECON CONTAINERSHIP 40' DRAFT

FOR MSI INSTRUCTIONAL PURPOSES ONLY

COMMAND	KNOTS	RPM
SEA SPEED	20.5	110
FULL AHEAD	12.1	65
HALF AHEAD	9.3	50
SLOW AHEAD	6.9	37
DEAD SLOW AHEAD	5.6	30
STOP	0	0

==========

DEAD SLOW ASTERN	-30
SLOW ASTERN	-37
HALF ASTERN	-50
FULL ASTERN	-65

NOTE: LOA 950 FT.
BEAM 106 FT.
DRAFT 40 FT. (F)
DISP. 89,000
ENG. 32,000 HP,
CAP. 2,219 FEU

UPDATED:20 MAR.92

(118) APL C-8 CONTAINERSHIP 40'DRAFT

FOR MSI INSTRUCTIONAL PURPOSES ONLY

COMMAND	KNOTS	RPM
FULL SEA SPEED	21.1	96
FULL AHEAD	13.2	60
HALF AHEAD	8.8	40
SLOW AHEAD	4.3	20
DEAD SLOW AHEAD	2.2	10
STOP	0	0

==========

DEAD SLOW ASTERN	-10
SLOW ASTERN	-20
HALF ASTERN	-40
FULL ASTERN	-50

NOTE: LOA 788 FT.
BEAM 100 FT.
DRAFT 40 FT.
DISP. 50,000
ENG. 32,000 ABS (D)
CAP. 2,305 TEU

UPDATED: 20 MAR.92

APPENDIX H

Description of MSI's Newport Facility

DESCRIPTION OF SIMULATORS

LEARNING CENTER

MarineSafety International's Shiphandling Learning Center is located in the Aquidneck Industrial Park in Middletown, Rhode Island, a 10 minute drive from the Newport Naval Base. The Center contains the simulator complex and the necessary support facilities which include classrooms, office space, student lounge, maintenance spaces, and computer room. The floor plan of the center is shown in Figure 1. The total area of the center is about 16,000ft sq of which about half is occupied by the simulator complex and the immediate support spaces. The center is arranged so that the simulator functions are separated from the administrative and support functions.

As noted above, the simulator complex, developed in response to the requirements of the Navy and MSI, consists of four simulators, 2-Visual Shiphandling Trainers (VST's) a Full Mission Bridge (FMB) Simulator and a Full Mission Bridge Wing Simulator (FMBW). These simulators may be operated independently or integrated together in a combined exercise. They all operate using the same mathematical models and data bases. In general the total software package is about 95 percent common between the four simulators. The following sections describe the simulators in more detail.

VISUAL SHIPHANDLING TRAINER

Two Visual Shiphandling Trainers (VST's) are located at the center. Figure 2 presents an arrangement drawing of a VST. Each VST is located in a compartment approximately 26 x 16 feet with decor to give the feel of a ships bridge. The major equipment in each VST includes:

- Ship Control Console
- 4 Channel CGI Visual System With a 180° x 30° Field of View
- Pelorus
- Raytheon RACAS V RADAR Display with ARPA
- Chart Table with PMP and Light
- Video Situation Display (VSD) with Touch Screen Control
- Simulated VHF Communications.

The simulator operators area includes a terminal to control the simulator, monitors to display the visual scene and VSD, a printer and a video hard copy device.

The design of the VST evolved from the original Navy requirement for a part task simulator with only a plan view and radar display. It was realized that a visual display would be of great value in meeting the training objectives. The design shown in Figure 2 was developed in

response to this changed requirement. The two VST's became operational in January of 1987.

In functions and capabilities, the VST's are similar to the full mission simulator. They run the same math models, data bases, and use the same computers and projection systems. The VST's differ from the full mission simulators in the following features:

- They require much less space
- The field of view is only 180° x 30° and the distance to the screen is less
- The students have direct control of tugs and moorings
- Only one simulator operator is required for two VST's but the simulator operator has no direct control of own ship
- One learning feedback center supports both VST's.

The VST's have proven to be very effective in meeting the objectives established for them.

FULL MISSION BRIDGE WING SIMULATOR

The Full Mission Bridge Wing (FMBW) simulator is unique. It provides a bridge wing environment with a correct visual display covering a field of view from 20 degrees over the bow, thru 220 degrees to 20 degrees over the stern in the horizontal plane and 15 degrees up and 30 degrees down for a total of 45 degrees in the vertical plane. The arrangement of the FMBW simulator is shown in Figure 3. Appendix A provides additional discussions of the rational and requirements associated with the FMBW.

The major equipment in the Bridge Wing Simulator includes:

- Bridge Wing with Displays
- 7 Channel CGI Visual System with 220° x 45° Field of View
- Pelorus
- Ratheon 12 inch Radar Display
- Video Situation Display
- Simulated MC and VHF Communications
- Sound System

A Learning Feedback Center (LFC) is associated with the FMBW Simulator. The LFC contains:

- Operator Console with Controls and Displays
- 7 Monitors to Display Visual Scene Channels
- Large Screen Projected Display of Video Situation Display
- Chart Table
- T.V. Monitoring of Wing
- Hard Copy Device.

The bridge wing is symmetric so that port or starboard is determined only by the screens upon which the bow and stern images are projected and the heading gyro-repeater in the pelorus. A forward view is also available which represents standing on an open bridge in front of the pilot house. The simulator operator can change the view from port to centerline to starboard wing in less than 5 seconds. This allows an exercise to start on one wing and change to the other wing as required by the scenarios.

The students on the bridge wing control over own ship by conning orders communicated over the MC cicuit to the simulator operator who in turn controls own ship from his console. Figure 4 shows the simulator operator console. The operator has direct control of own ship, moorings, tugs, and traffic ships as well as simulator functions (for example, viewing position, day, dusk, night, wind, current, etc.). The console displays include own ship parameters, Video Situation Display with mouse control of functions, and simulator control menues.

FULL MISSION BRIDGE SIMULATOR

The Full Mission Bridge (FMB) Simulator is the most conventional simulator at the center. It proves a full bridge environment with a CGI visual display covering a field of view of 220 degrees horizontal by 45 degrees (20 up - 25 down) vertical. The arrangement of the FMB is shown in Figure 5. The bridge itself is configured to represent a generic Navy bridge typical of a destroyer type vessel. The color and "decor" is typical of a Navy bridge rather than the more sterile "computer room" look of most simulator bridges.

The major equipment in the Full Mission Bridge includes:

- Pilot House
- 7 Channel CGI Visual System with 220° x 45° field of view
- Ship Control Console
- 2 Chart Tables with Lights and PMP's
- Navigation Displays
- 2 Radar Displays (Ratheon RACASIV ARPA and 16 inch display)
- Video Situation Display
- MC and VHF Communications
- Sound System

A learning feedback center is associated wit the FMB. It is identical to the LFC described above for the FMWB simulator. The only addition is a slave radar display.

The students on the bridge have direct control of all own ship functions. The simulator operator has control of tugs, moorings, and anchors as well as traffic ships and simulator functions. The operator also has the option of controlling all own ship functions from his control console. The simulator control console itself is identical to the one in the bridge wing simulator.

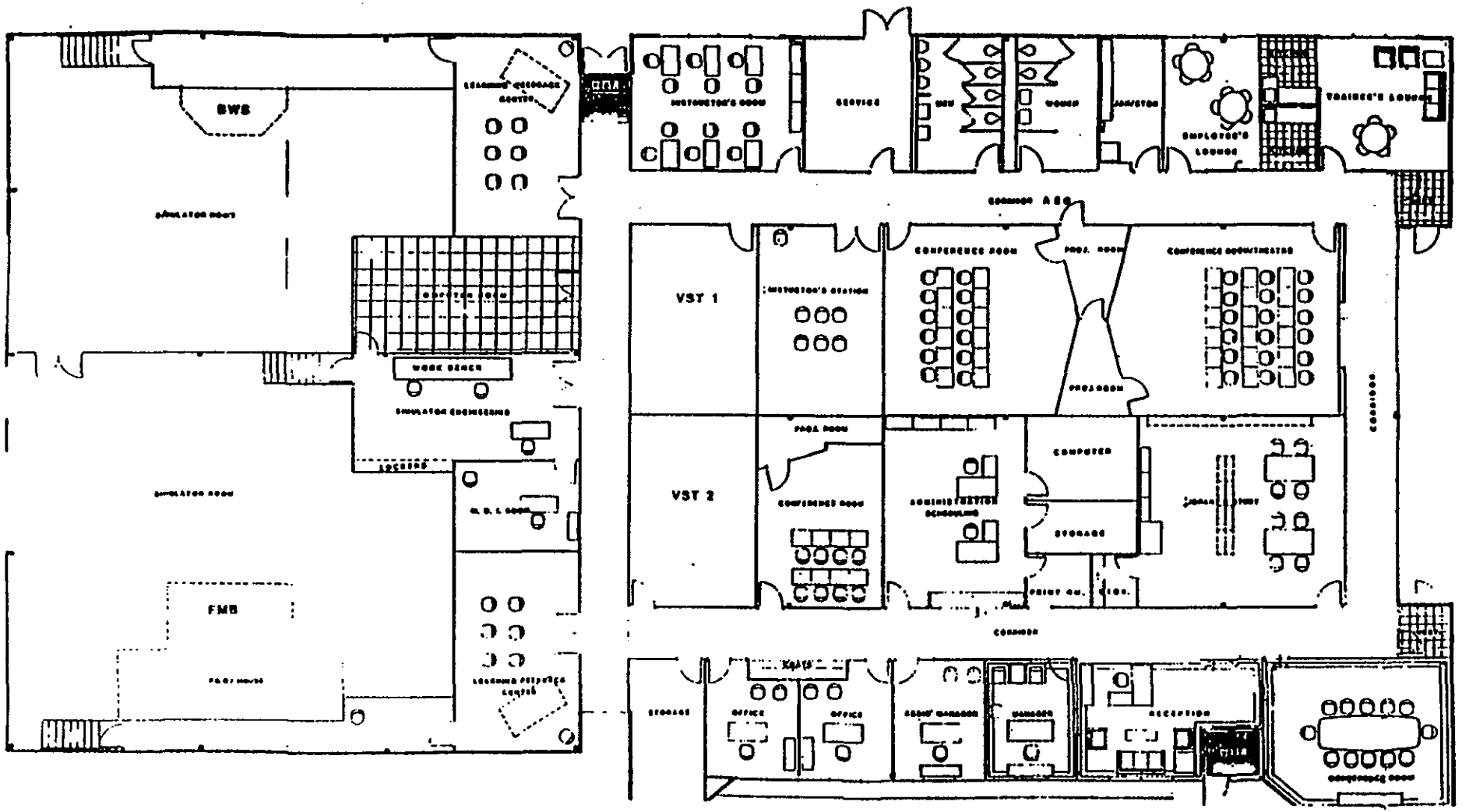


FIGURE 1

Facility Floor Plan

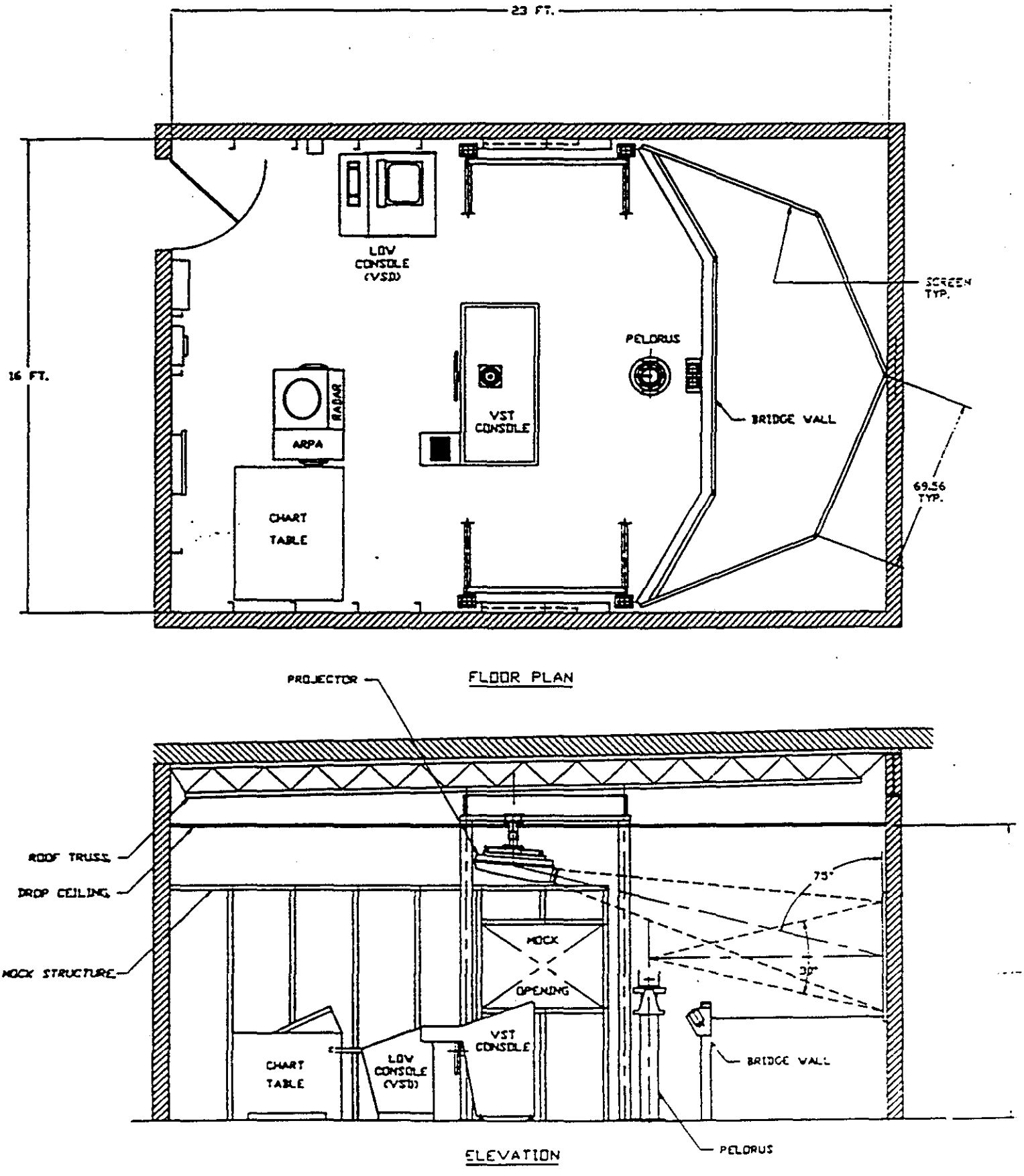
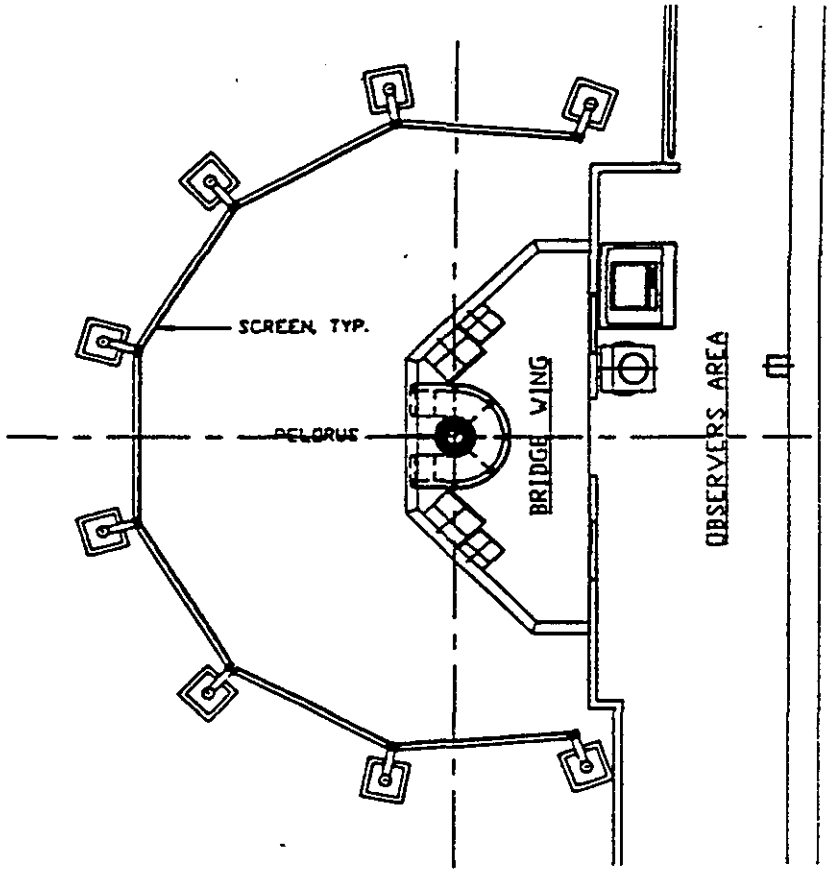
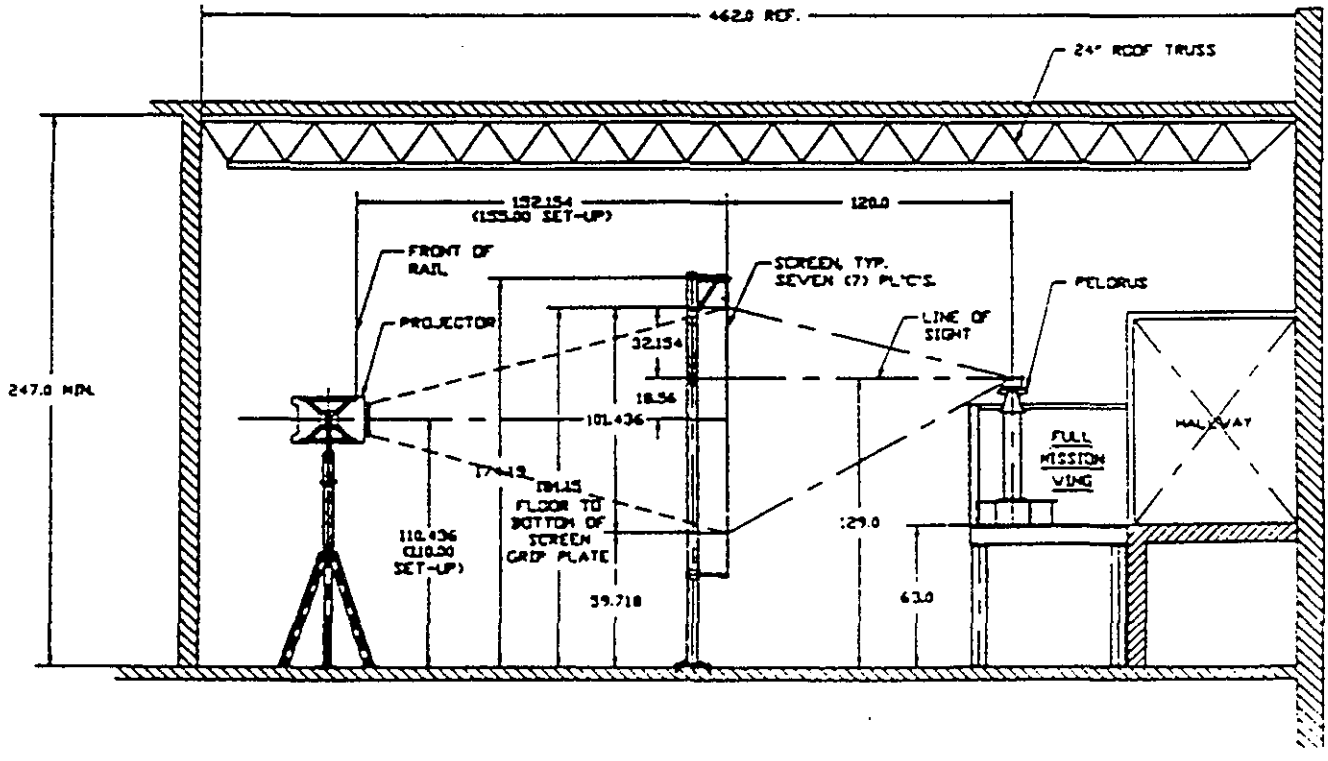


FIGURE 2 - ARRANGEMENT OF VISUAL SHIPHANDLING TRAINER



PLAN VIEW



SIDE ELEVATION

FIGURE 3 - ARRANGEMENT OF FULL MISSION BRIDGE WING SIMULATION

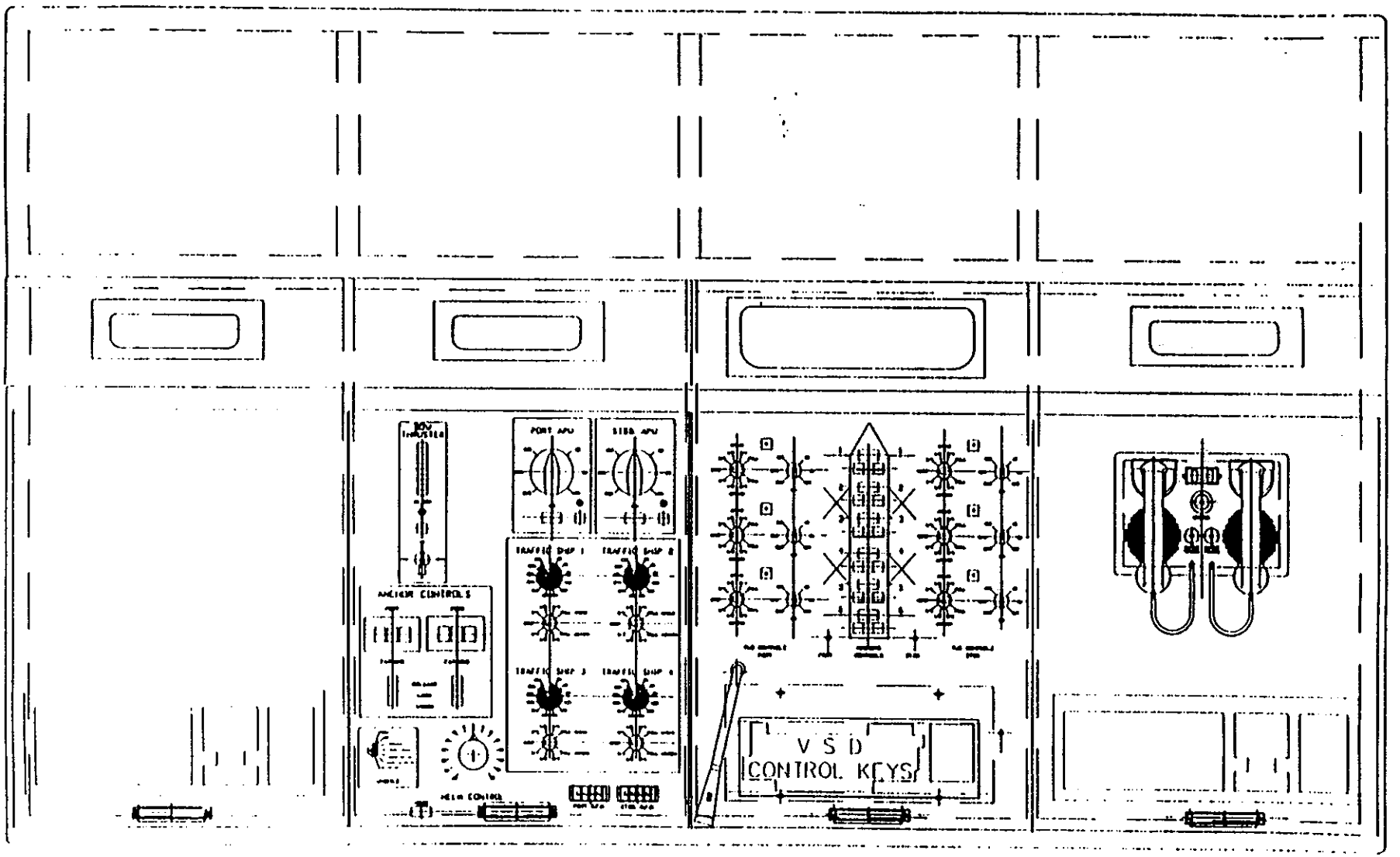
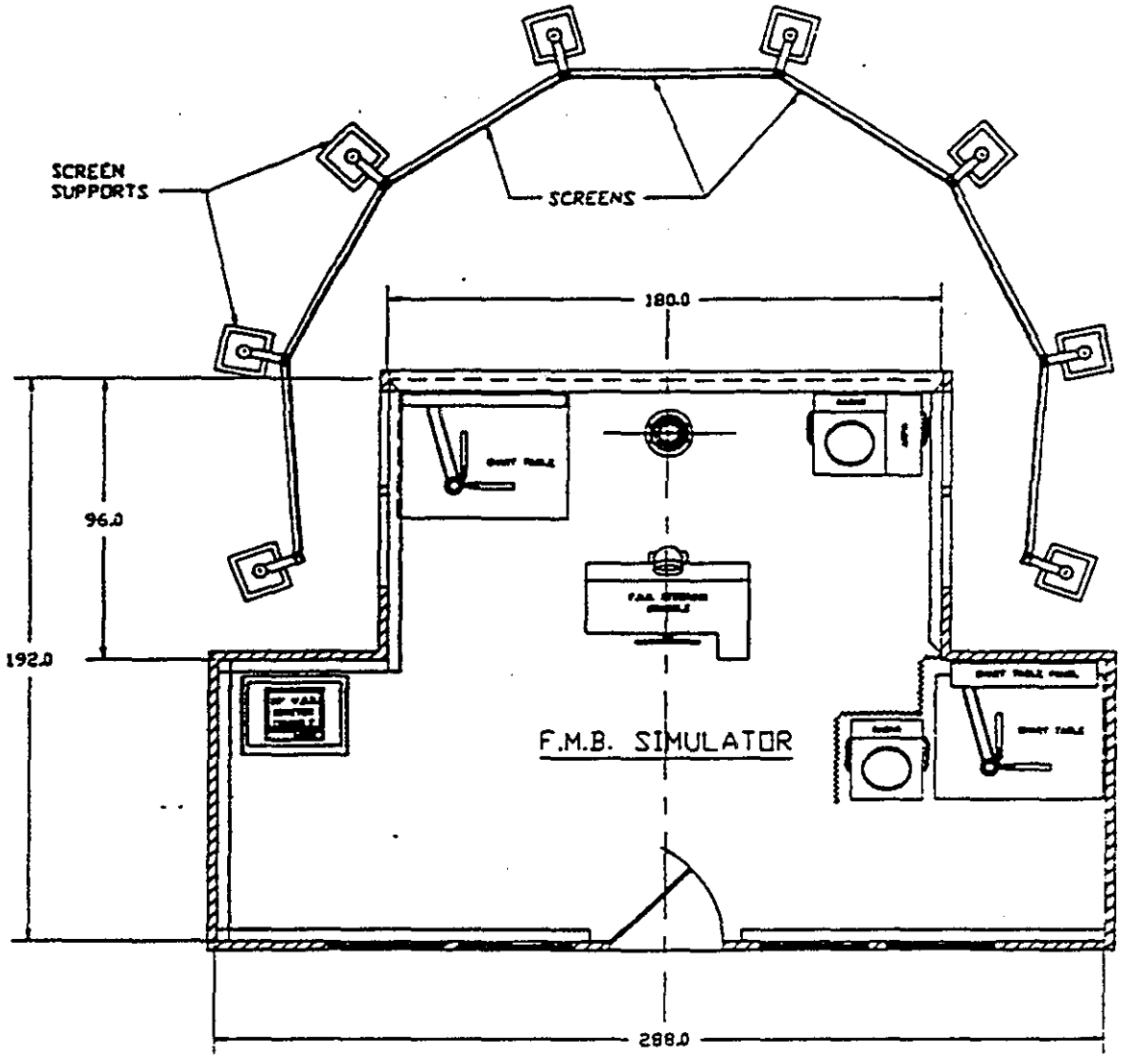
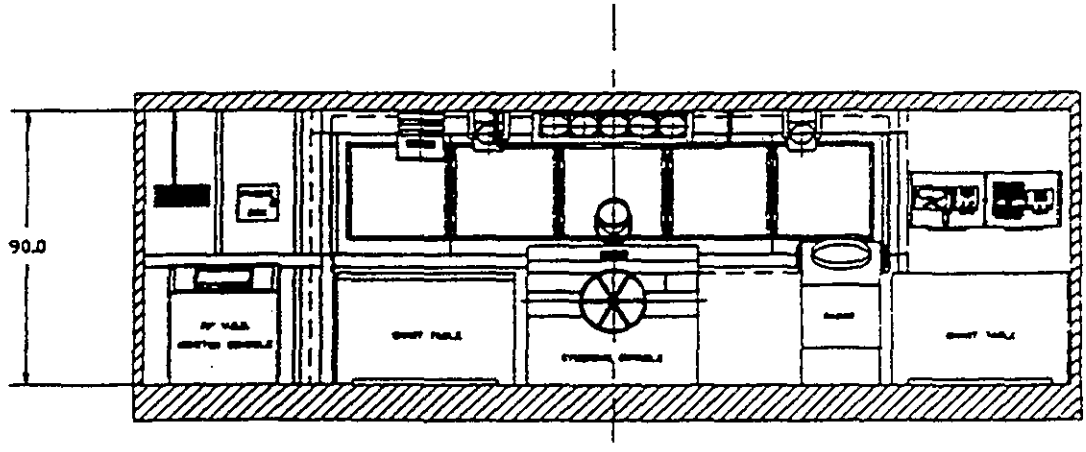


FIGURE 4 - SIMULATOR OPERATORS CONSOLE



PLAN VIEW



ELEVATION

FIGURE 5 - ARRANGEMENT OF FULL MISSION BRIDGE SIMULATOR